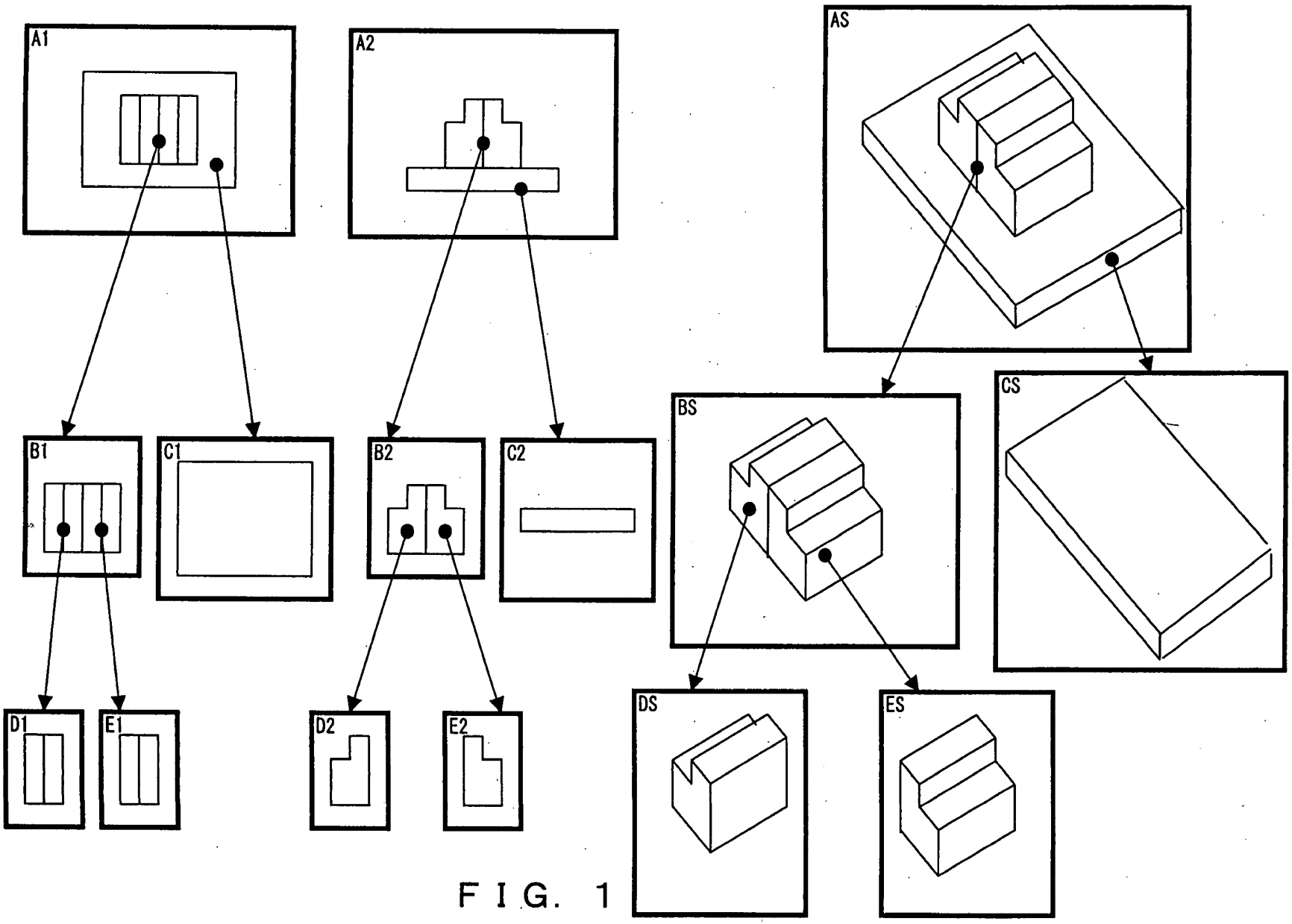


FIG. 1

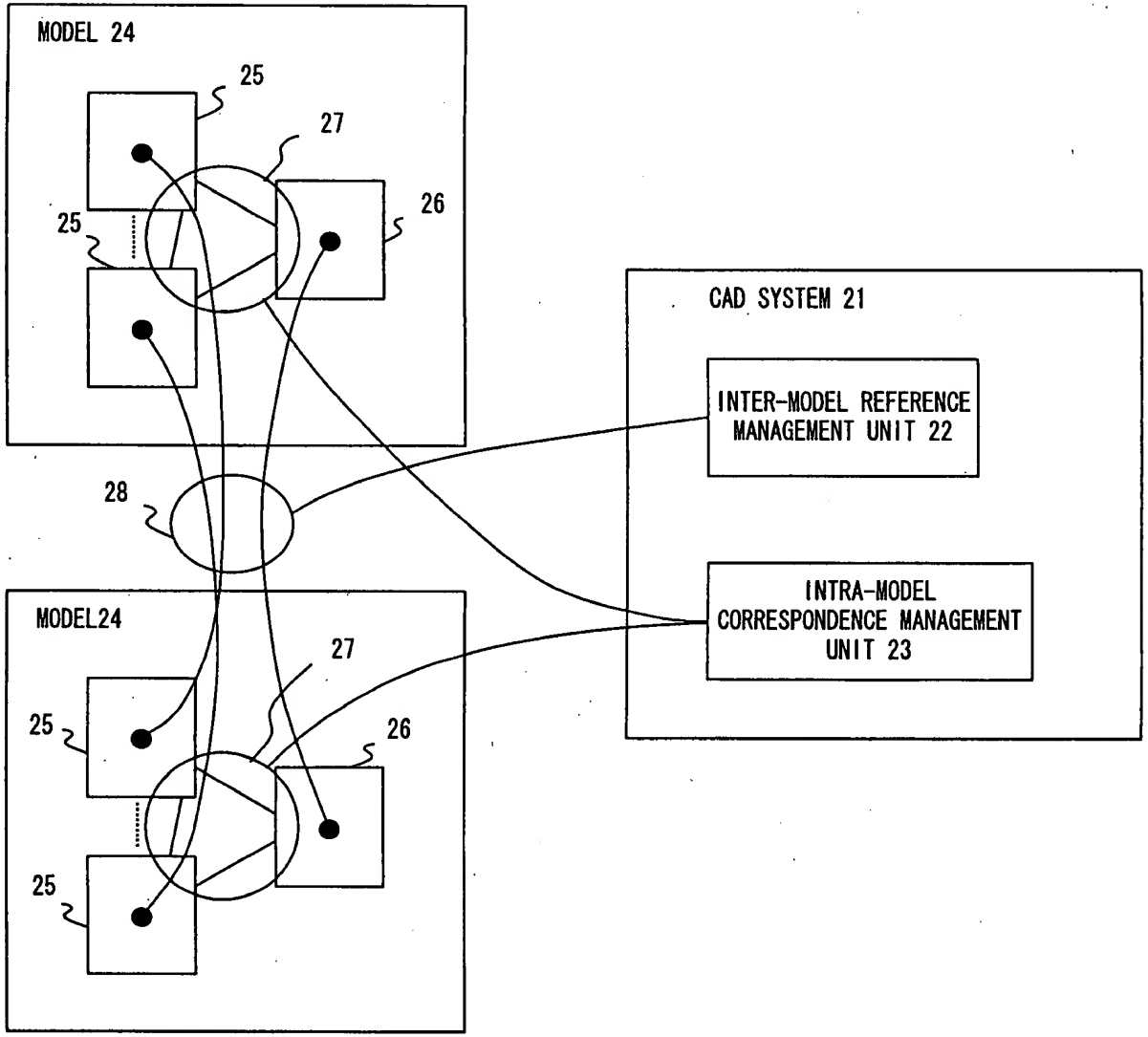

MODEL 24
25
27
26
25
28
MODEL24
27
25
26
25
CAD SYSTEM 21
INTER-MODEL REFERENCE MANAGEMENT UNIT 22
INTRA-MODEL CORRESPONDENCE MANAGEMENT UNIT 23

FIG. 2

MODEL INFORMATION

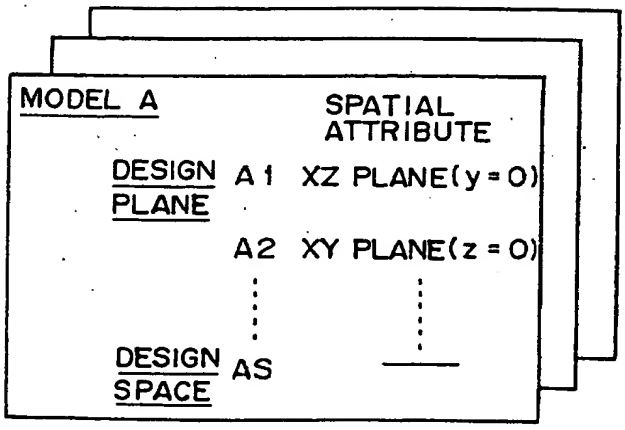


FIG. 3A

MODEL REFERENCE INFORMATION

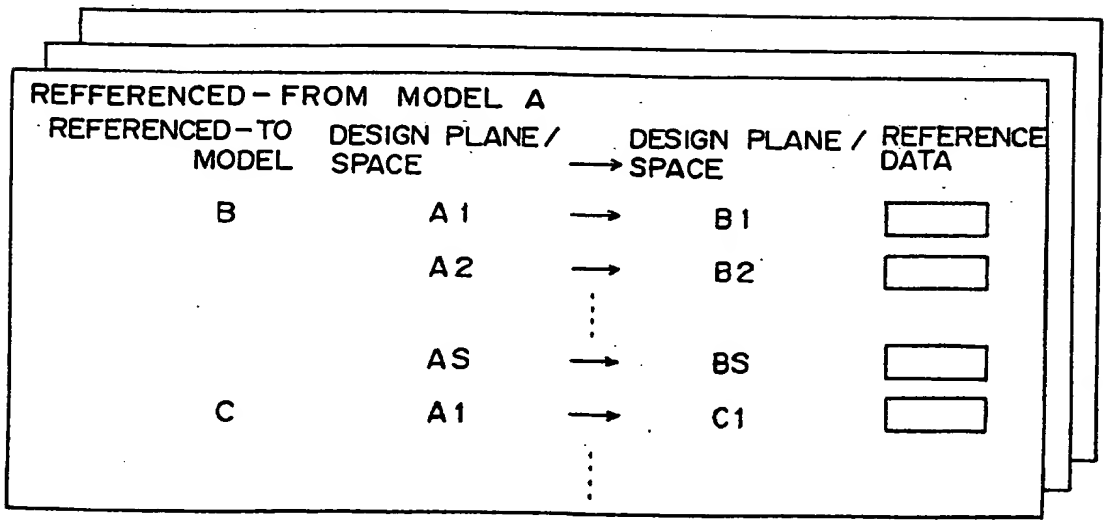


FIG. 3B

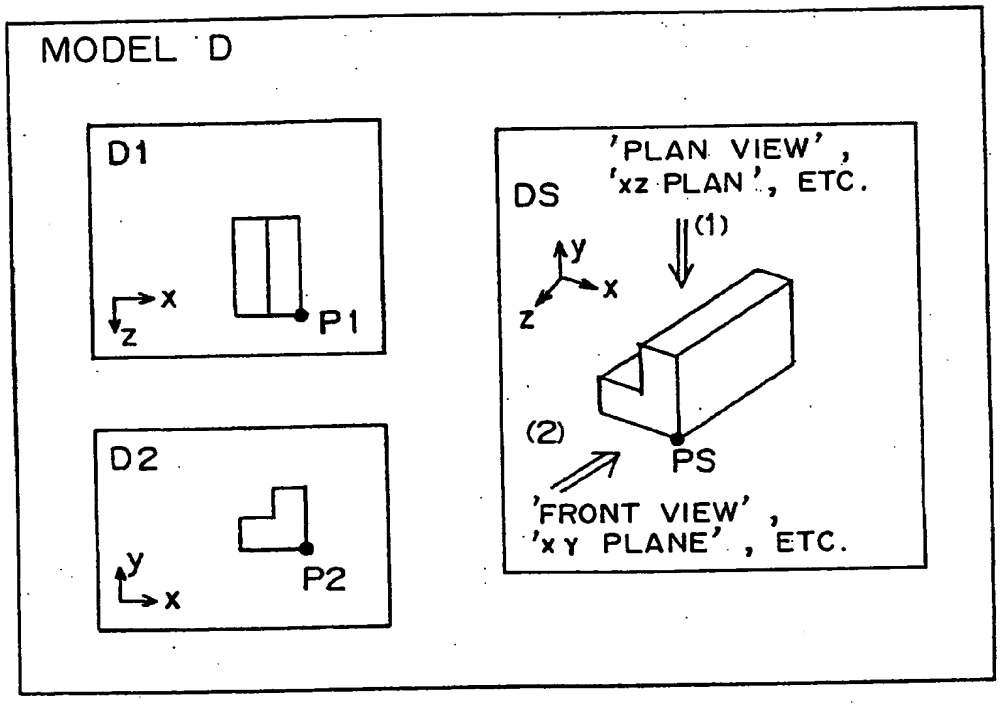

MODEL D
D1
x
z
P1
D2
y
x
P2
DS
'PLAN VIEW',
'xz PLAN', ETC.
(1)
y
x
z
(2)
PS
'FRONT VIEW',
'xy PLANE', ETC.

FIG. 4

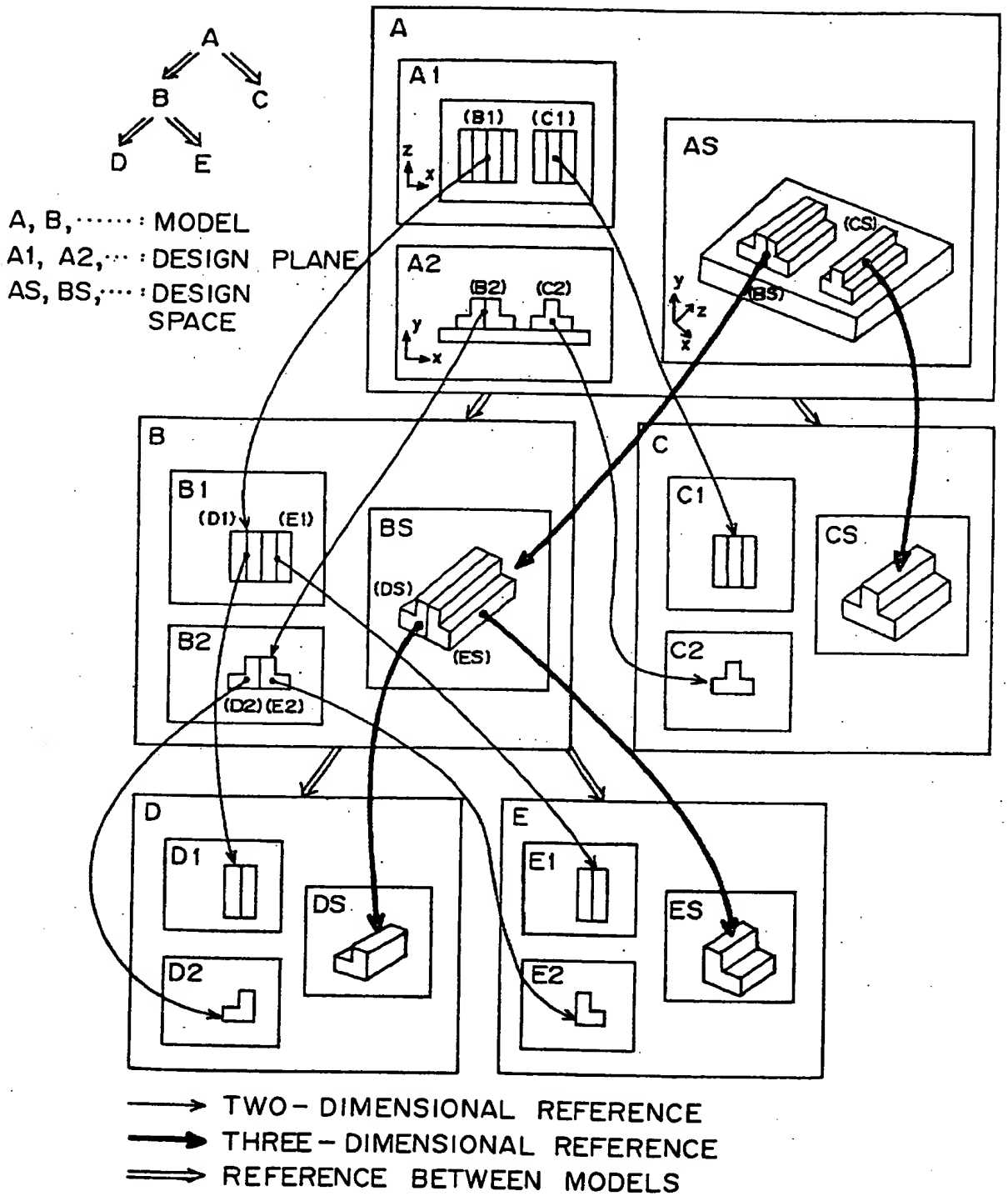

A
B
C
D
E
A, B, ····· : MODEL
A1, A2, ··· : DESIGN PLANE
AS, BS, ···· : DESIGN SPACE
A
A1
(B1)
(C1)
A2
(B2)
(C2)
AS
(CS)
(BS)
B
B1
(D1)
(E1)
B2
(D2)
(E2)
BS
(DS)
(ES)
C
C1
CS
C2
D
D1
D2
DS
E
E1
E2
ES
TWO-DIMENSIONAL REFERENCE
THREE-DIMENSIONAL REFERENCE
REFERENCE BETWEEN MODELS

FIG. 5

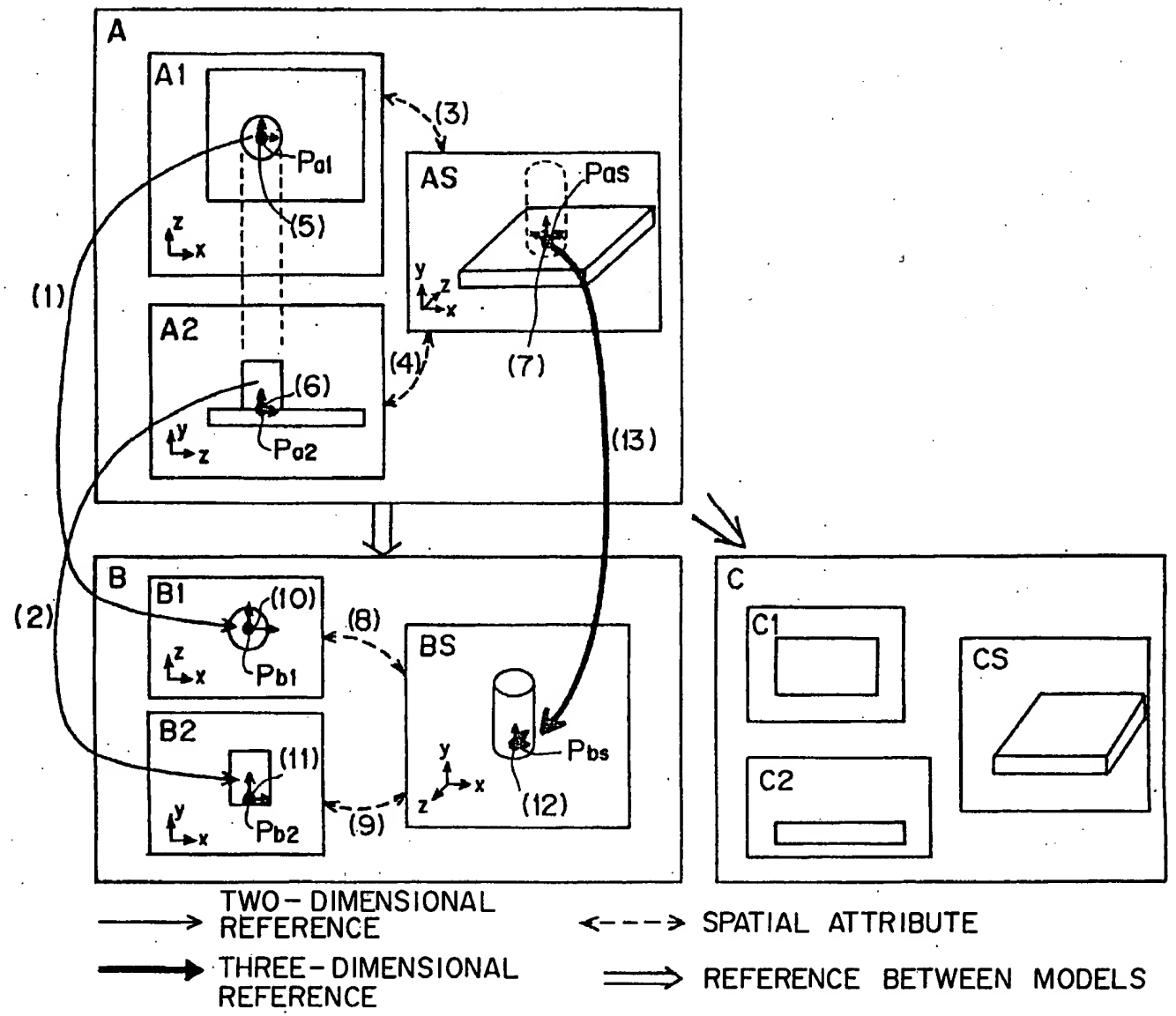


FIG. 6

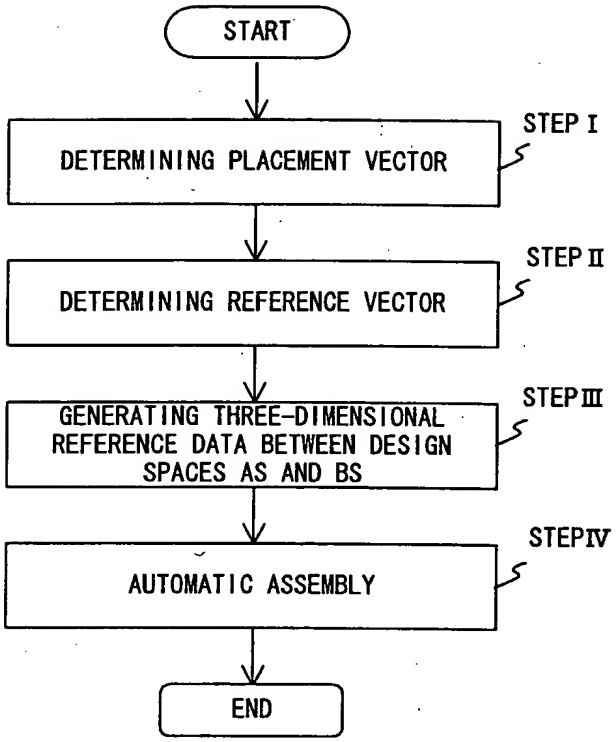

START
DETERMINING PLACEMENT VECTOR
STEP I
DETERMINING REFERENCE VECTOR
STEP II
GENERATING THREE-DIMENSIONAL REFERENCE DATA BETWEEN DESIGN SPACES AS AND BS
STEP III
AUTOMATIC ASSEMBLY
STEP IV
END

FIG. 7

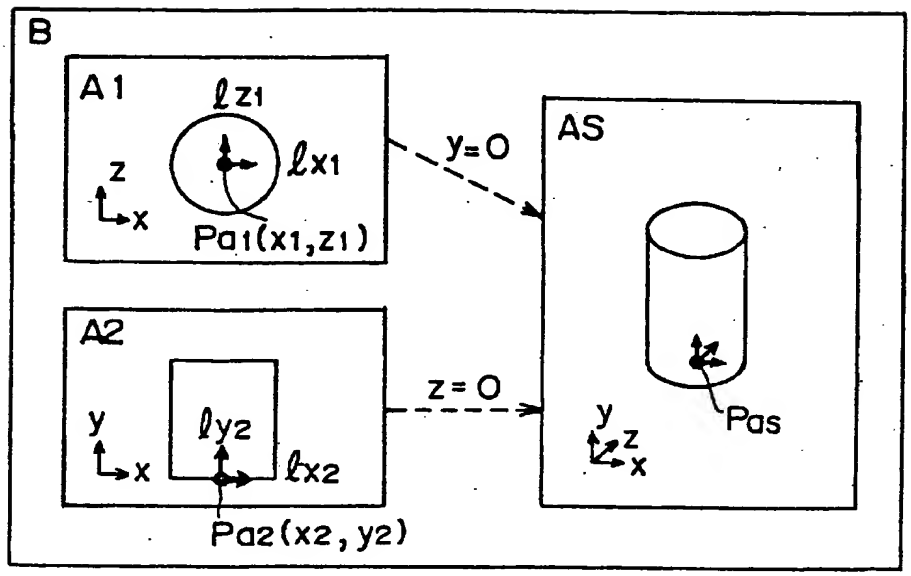

B
A1
ℓz1
ℓx1
z
x
Pa1(x1,z1)
y=0
AS
A2
y
ℓy2
x
ℓx2
Pa2(x2, y2)
z=0
y
z
x
Pas

FIG. 8A

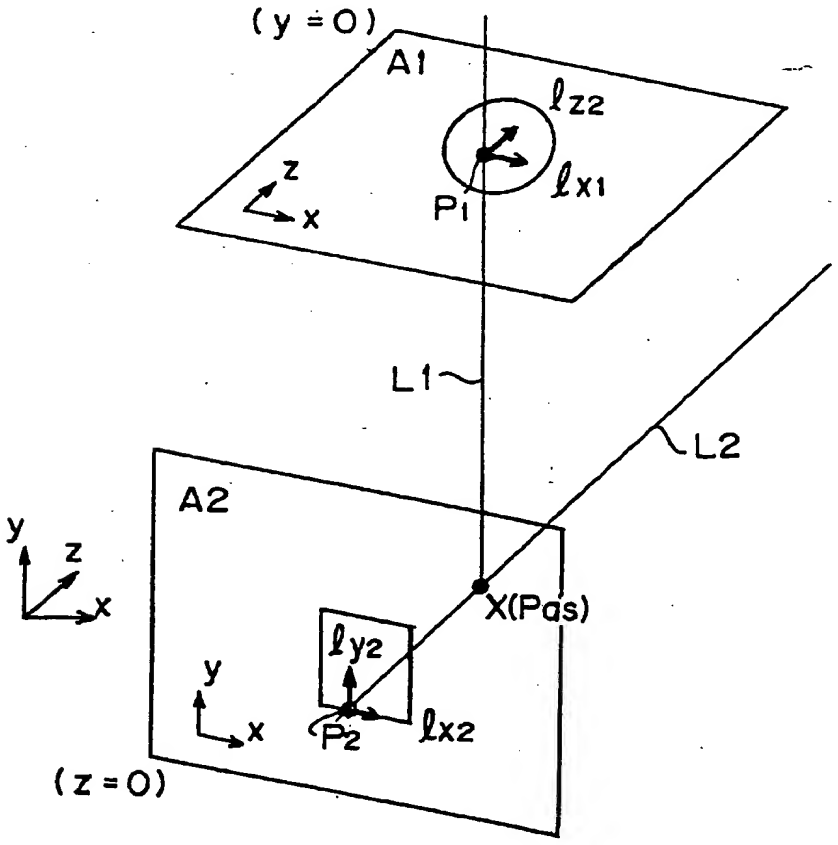

(y = 0)
A1
ℓz2
z
x
P1
ℓx1
L1
L2
A2
y
z
x
X(Pas)
ℓy2
y
x
P2
ℓx2
(z = 0)

FIG. 8B

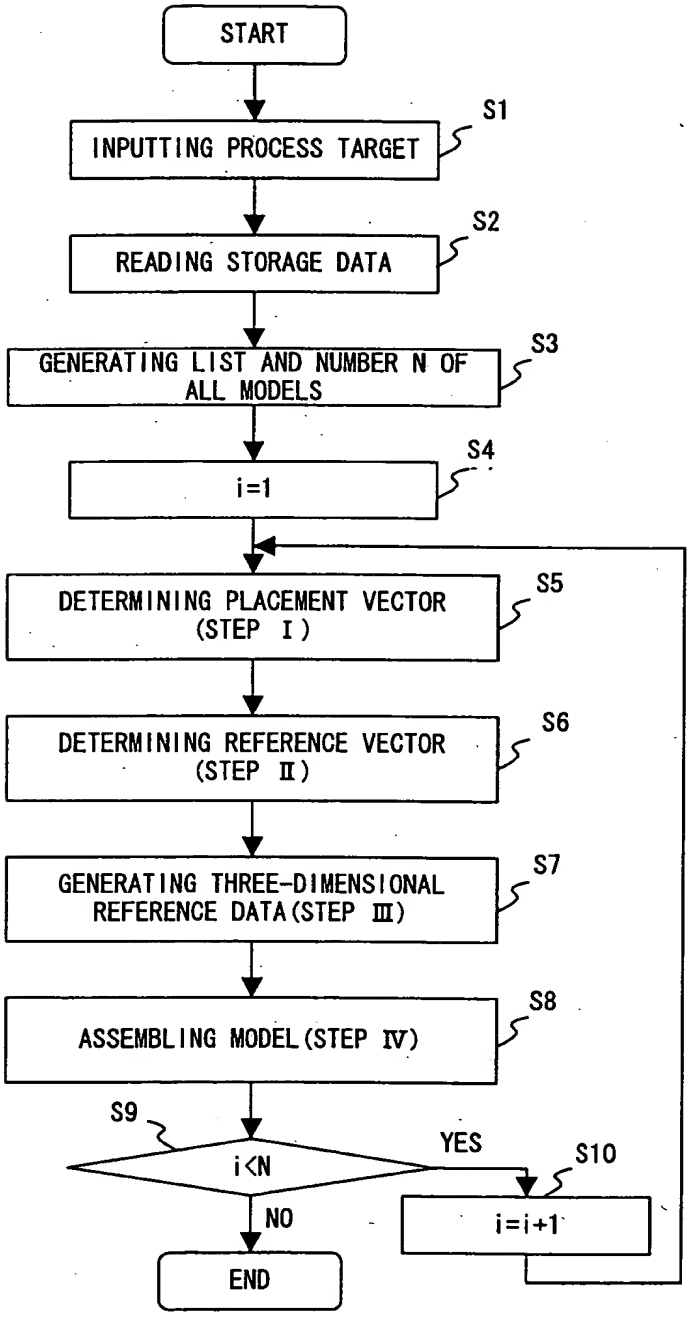

START
S1
INPUTTING PROCESS TARGET
S2
READING STORAGE DATA
S3
GENERATING LIST AND NUMBER N OF ALL MODELS
S4
i=1
S5
DETERMINING PLACEMENT VECTOR (STEP I)
S6
DETERMINING REFERENCE VECTOR (STEP II)
S7
GENERATING THREE-DIMENSIONAL REFERENCE DATA(STEP III)
S8
ASSEMBLING MODEL(STEP IV)
S9
i<N
YES
S10
i=i+1
NO
END

FIG. 9

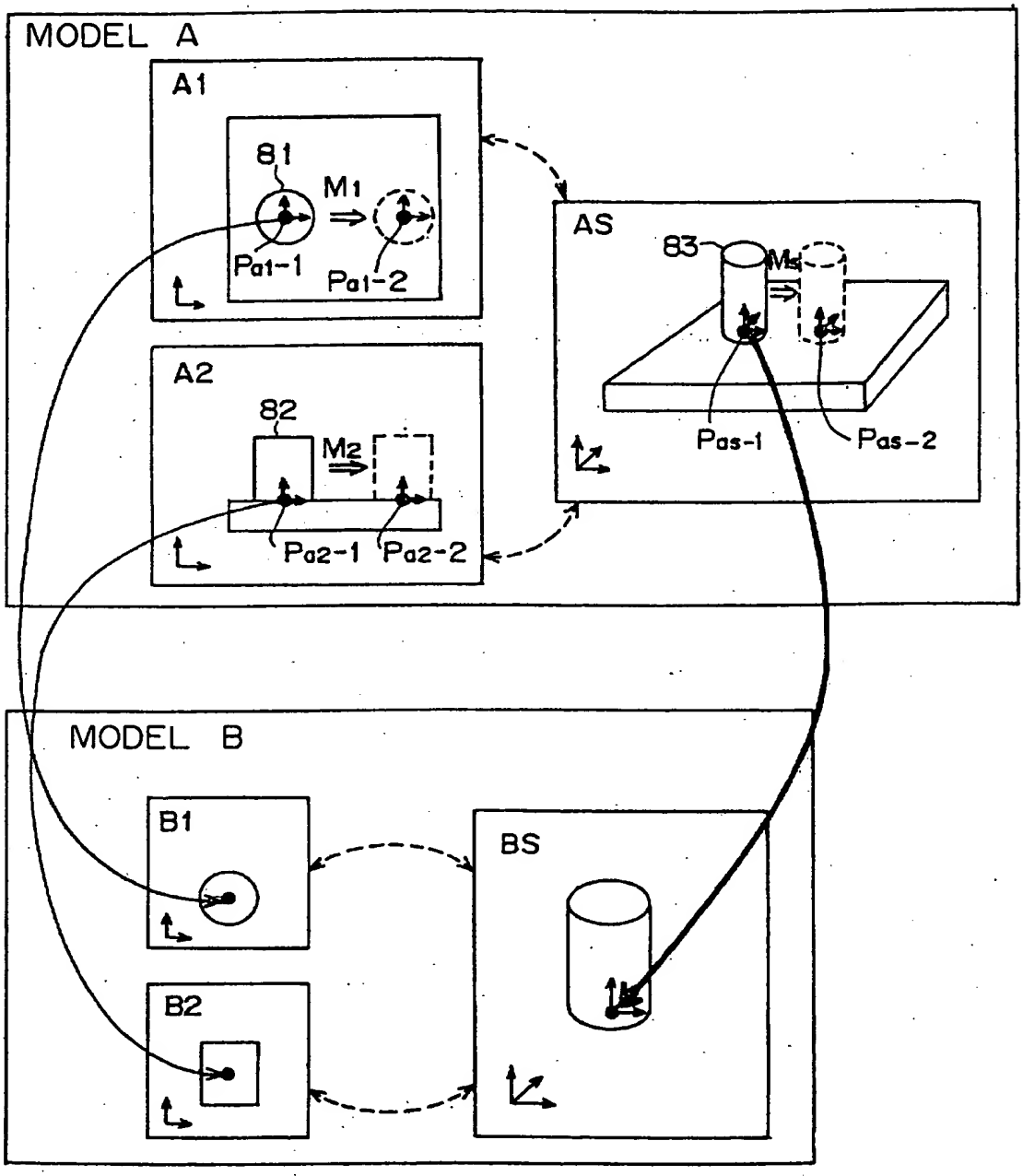

MODEL A
A1
81
M1
Pa1-1
Pa1-2
A2
82
M2
Pa2-1
Pa2-2
AS
83
Ms
Pas-1
Pas-2
MODEL B
B1
B2
BS

FIG. 10

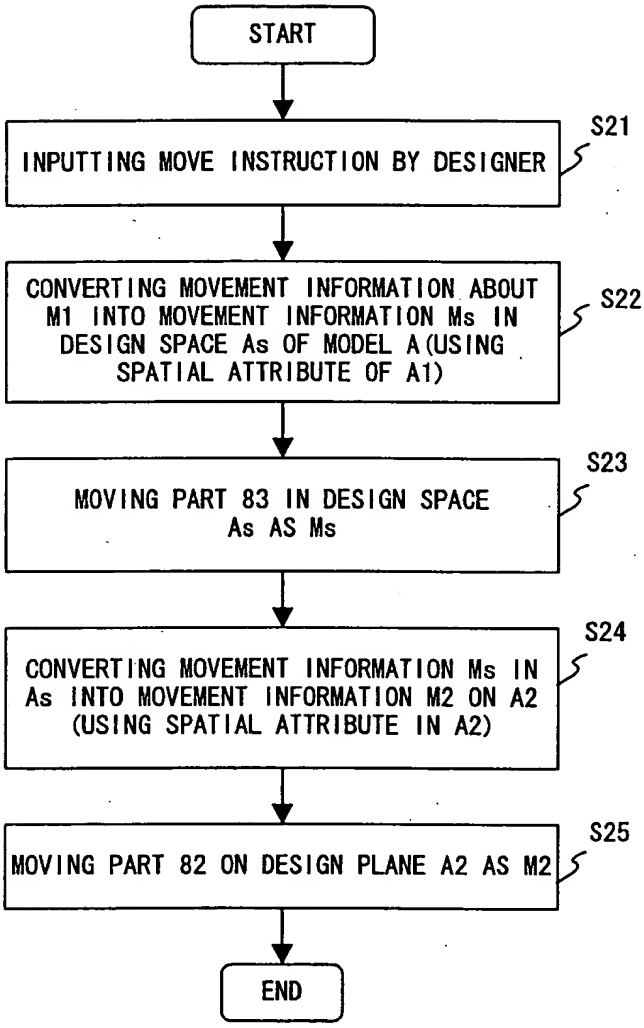

START
INPUTTING MOVE INSTRUCTION BY DESIGNER
S21
CONVERTING MOVEMENT INFORMATION ABOUT M1 INTO MOVEMENT INFORMATION Ms IN DESIGN SPACE As OF MODEL A(USING SPATIAL ATTRIBUTE OF A1)
S22
MOVING PART 83 IN DESIGN SPACE As AS Ms
S23
CONVERTING MOVEMENT INFORMATION Ms IN As INTO MOVEMENT INFORMATION M2 ON A2 (USING SPATIAL ATTRIBUTE IN A2)
S24
MOVING PART 82 ON DESIGN PLANE A2 AS M2
S25
END

FIG. 11

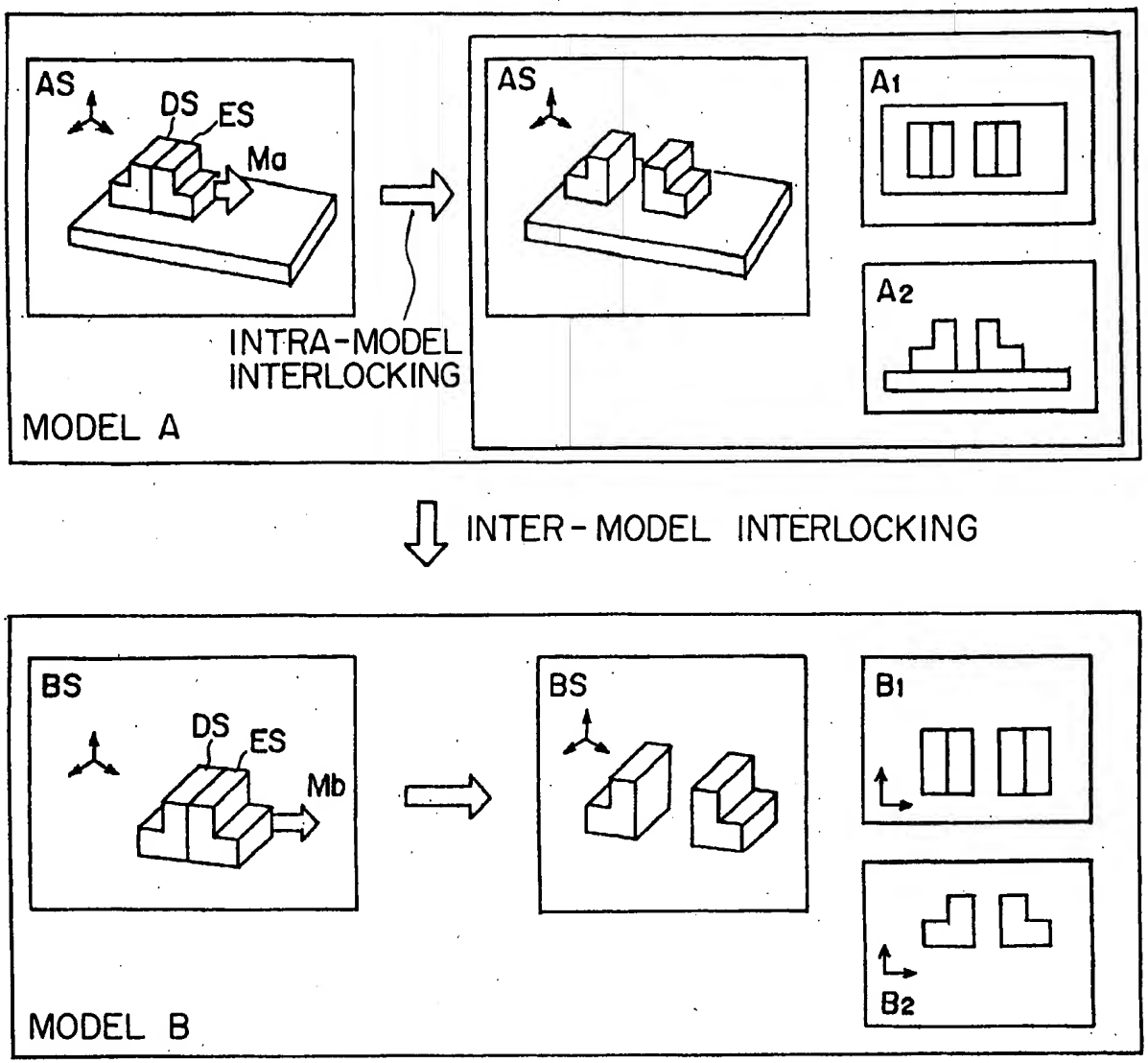

AS
DS
ES
Ma
INTRA-MODEL
INTERLOCKING
MODEL A
AS
A1
A2
INTER-MODEL INTERLOCKING
BS
DS
ES
Mb
MODEL B
BS
B1
B2

FIG. 12

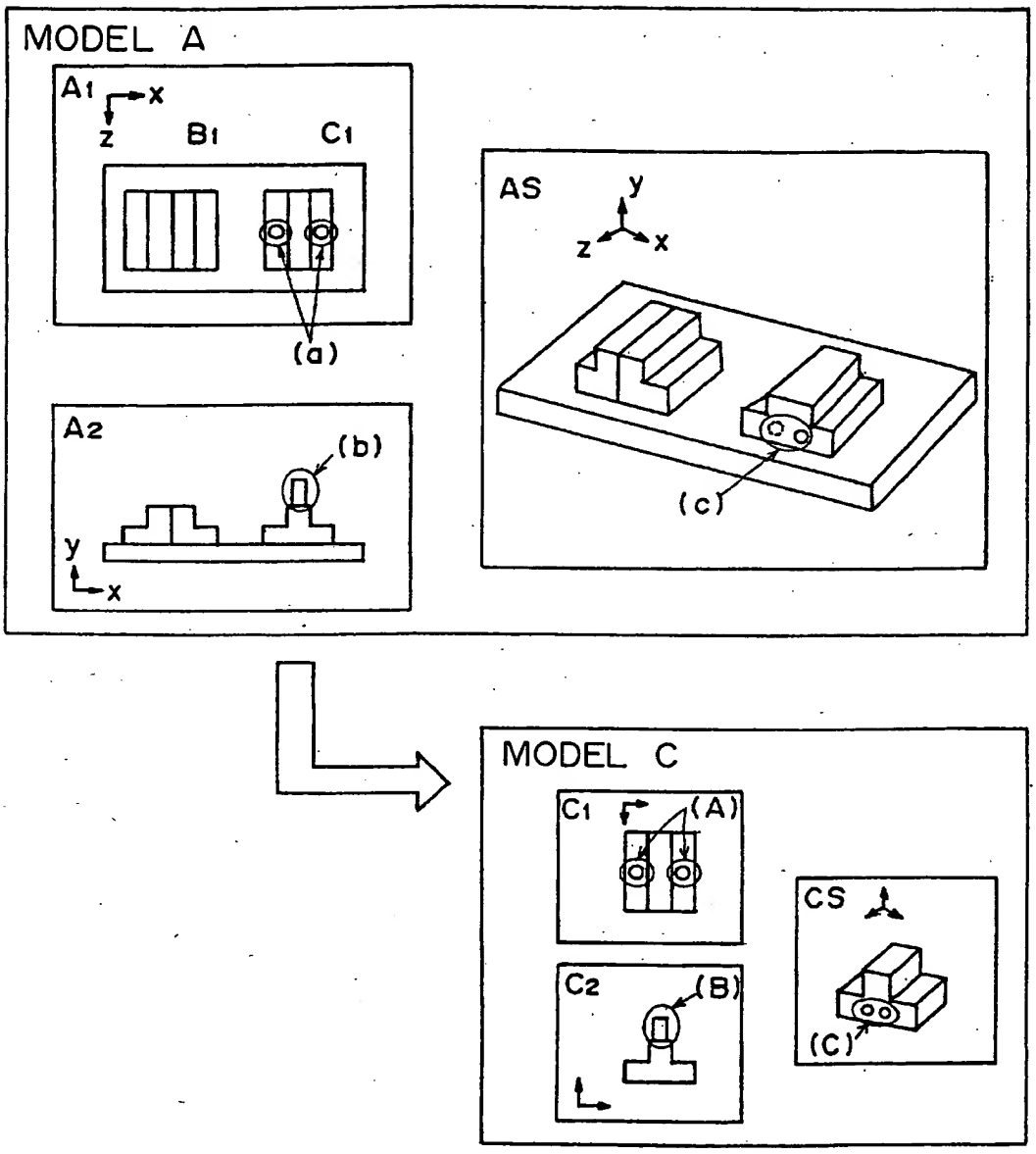


FIG. 13

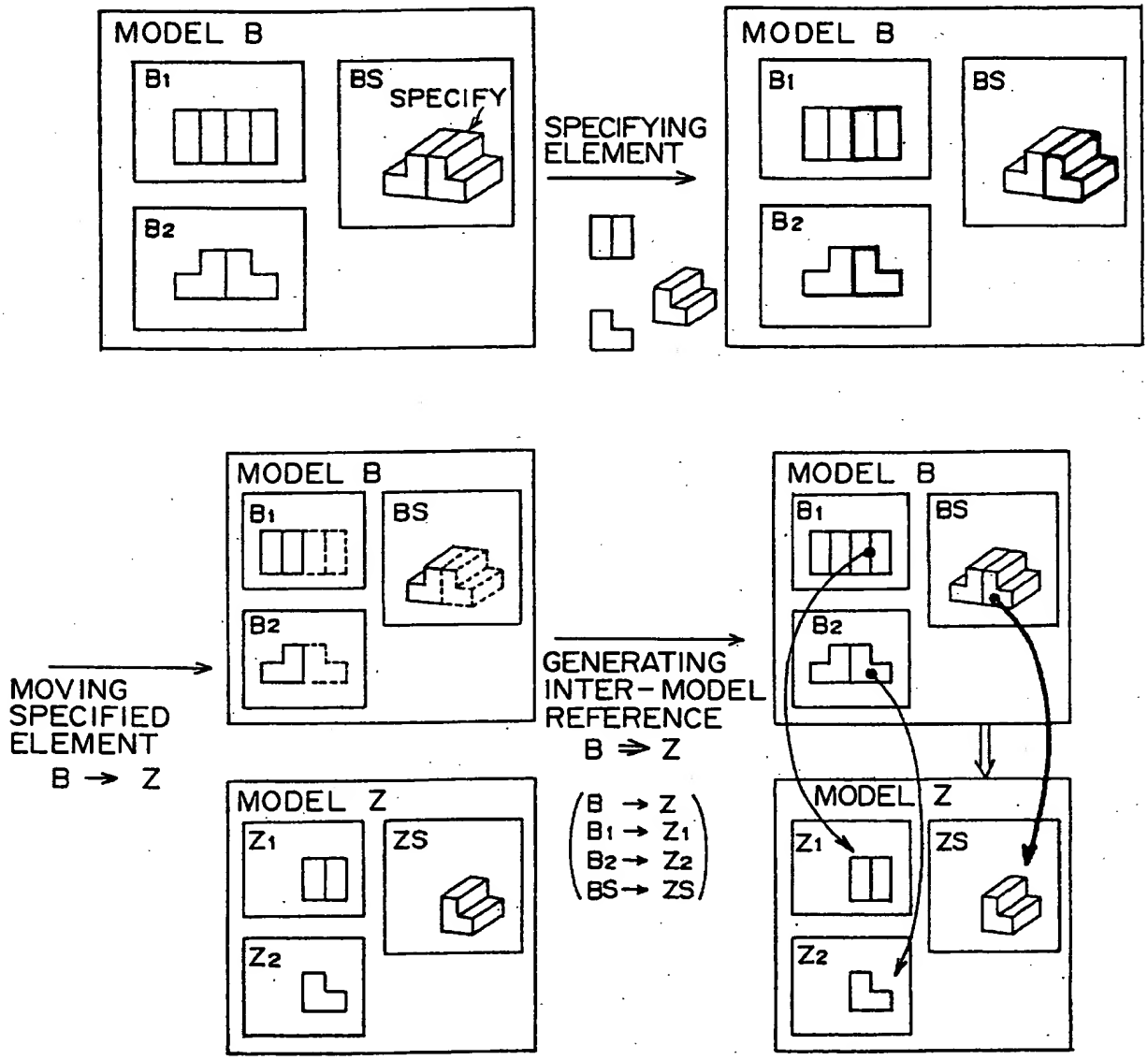

MODEL B
B1
BS
SPECIFY
B2
SPECIFYING
ELEMENT
MODEL B
B1
BS
B2
MOVING
SPECIFIED
ELEMENT
B → Z
MODEL B
B1
BS
B2
MODEL Z
Z1
ZS
Z2
GENERATING
INTER-MODEL
REFERENCE
B ⇒ Z
(B → Z
B1 → Z1
B2 → Z2
BS → ZS)
MODEL B
B1
BS
B2
MODEL Z
Z1
ZS
Z2

FIG. 14

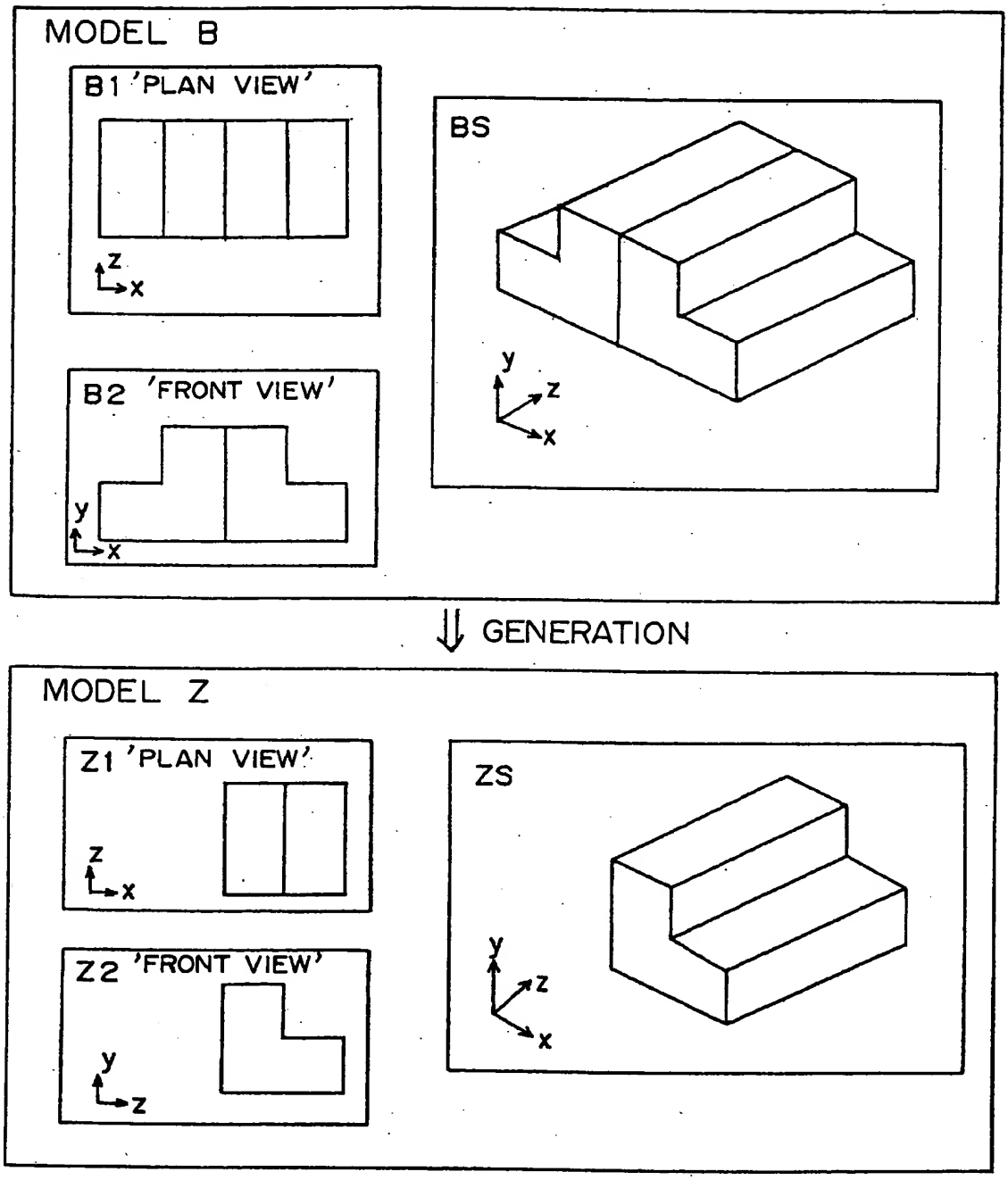

MODEL B
B1 'PLAN VIEW'
z
x
B2 'FRONT VIEW'
y
x
BS
y
z
x
GENERATION
MODEL Z
Z1 'PLAN VIEW'
z
x
Z2 'FRONT VIEW'
y
z
ZS
y
z
x

FIG. 15

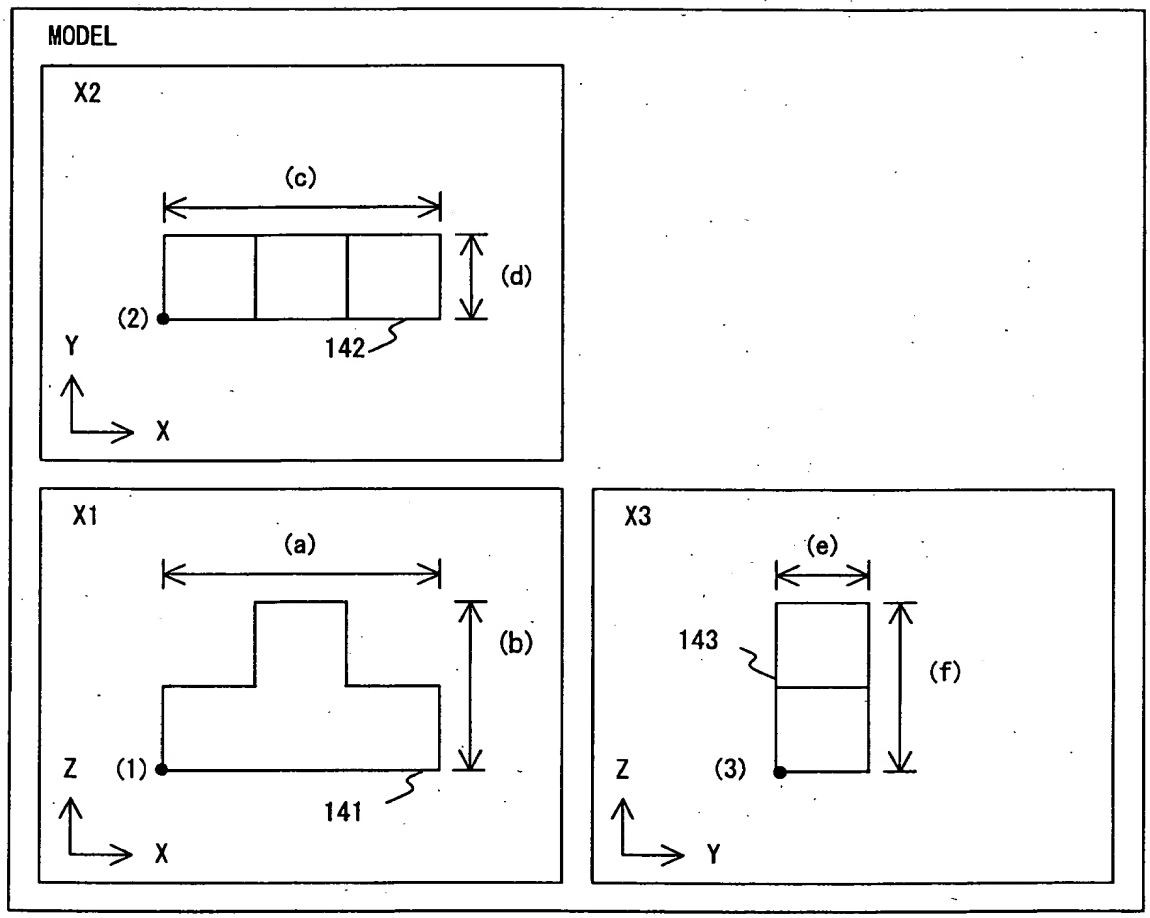


FIG. 16

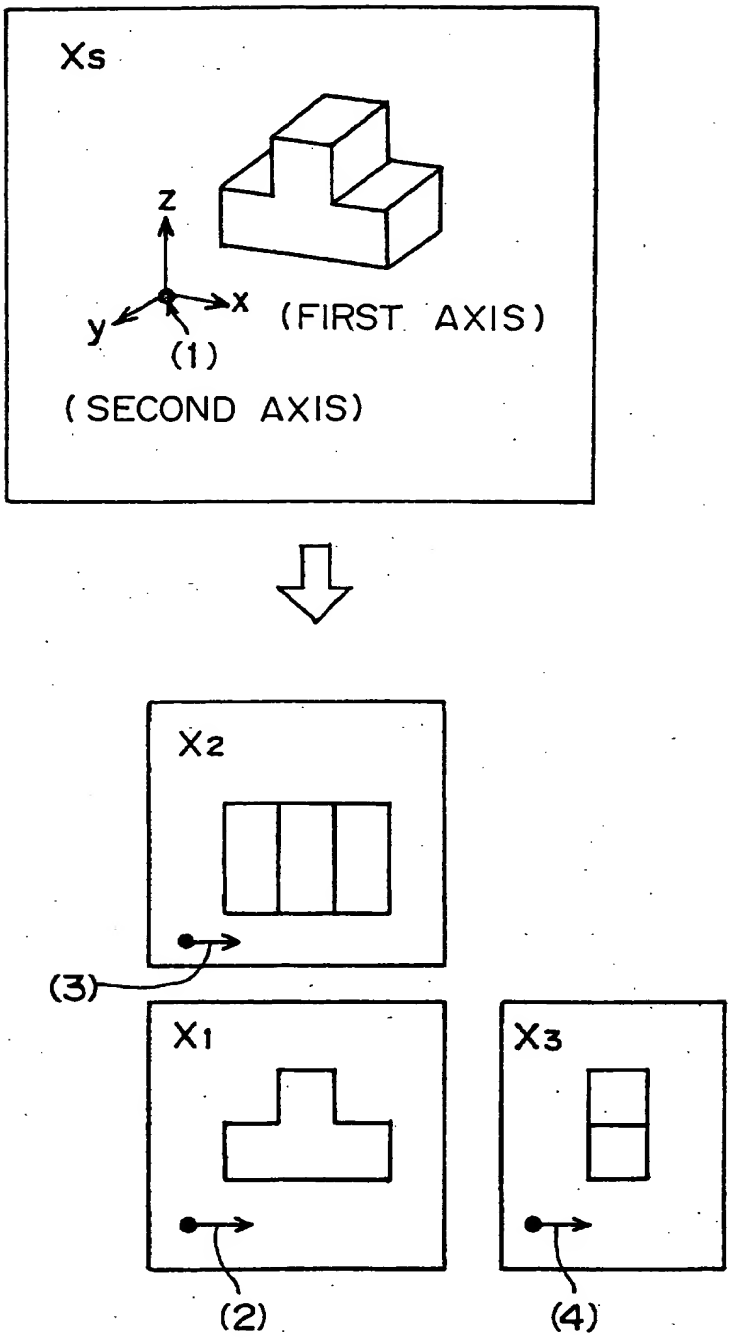
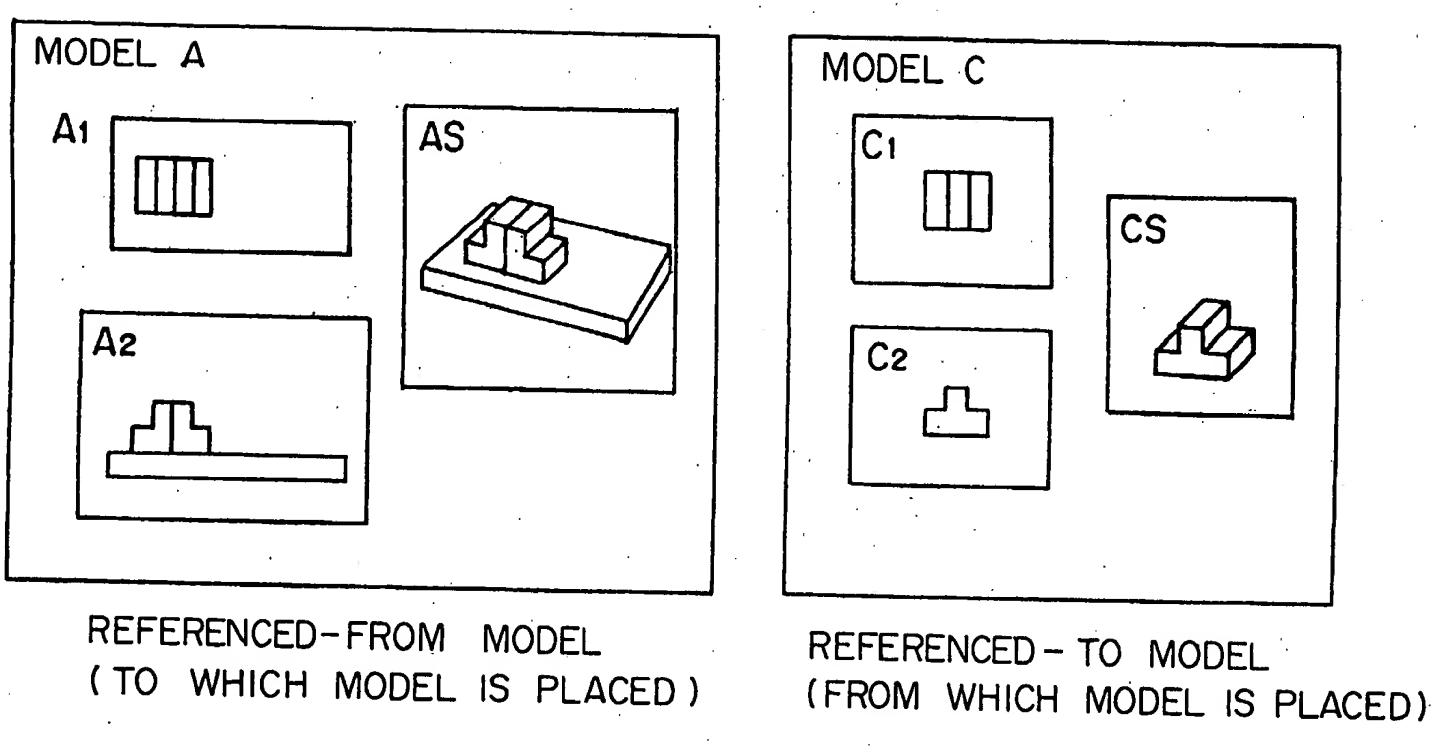


FIG. 17



REFERENCED-FROM MODEL
(TO WHICH MODEL IS PLACED)

REFERENCED-TO MODEL
(FROM WHICH MODEL IS PLACED)

FIG. 18

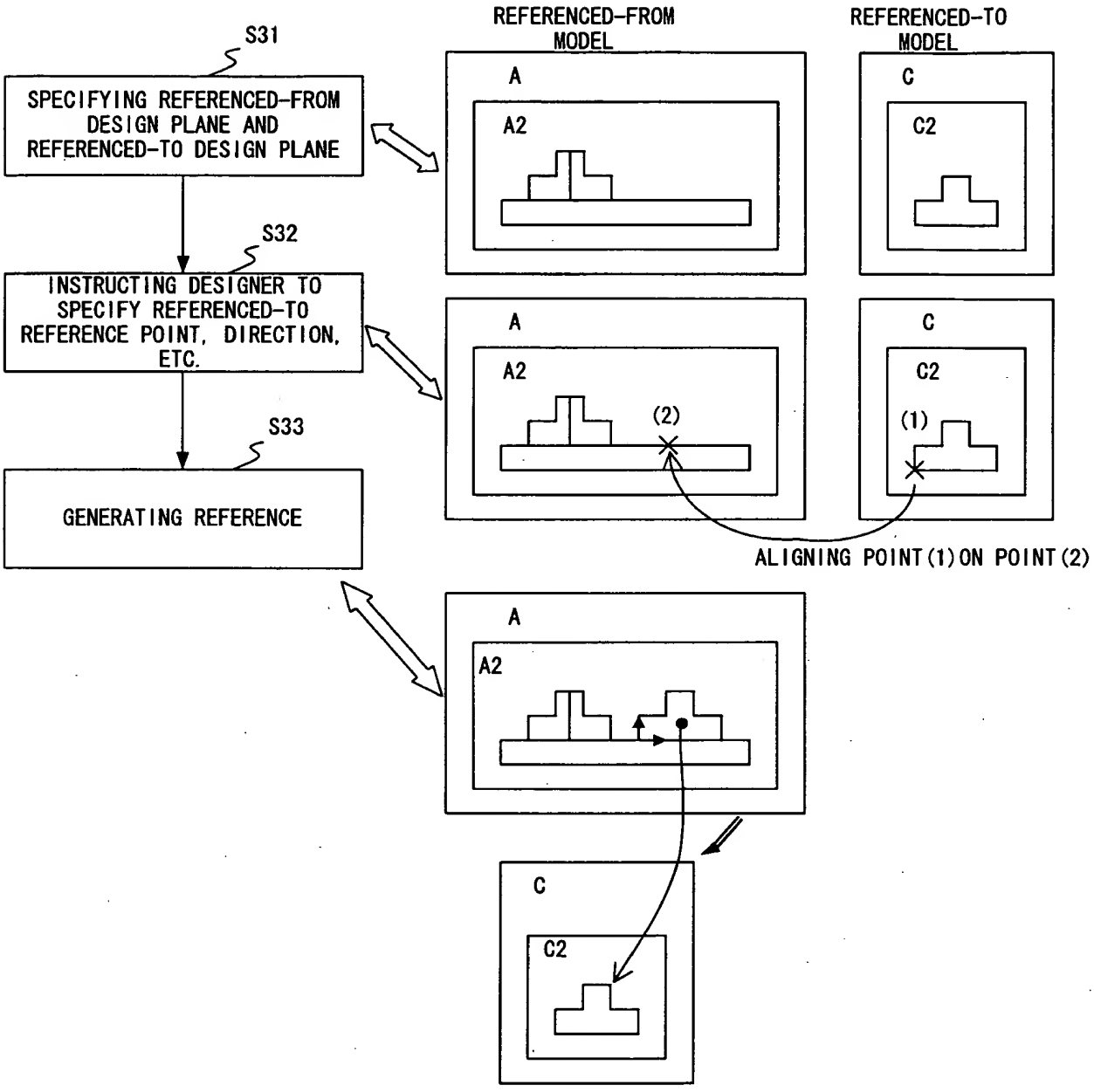

S31
SPECIFYING REFERENCED-FROM DESIGN PLANE AND REFERENCED-TO DESIGN PLANE
S32
INSTRUCTING DESIGNER TO SPECIFY REFERENCED-TO REFERENCE POINT, DIRECTION, ETC.
S33
GENERATING REFERENCE
REFERENCED-FROM MODEL
REFERENCED-TO MODEL
A
A2
C
C2
(1)
(2)
ALIGNING POINT(1) ON POINT(2)

FIG. 19

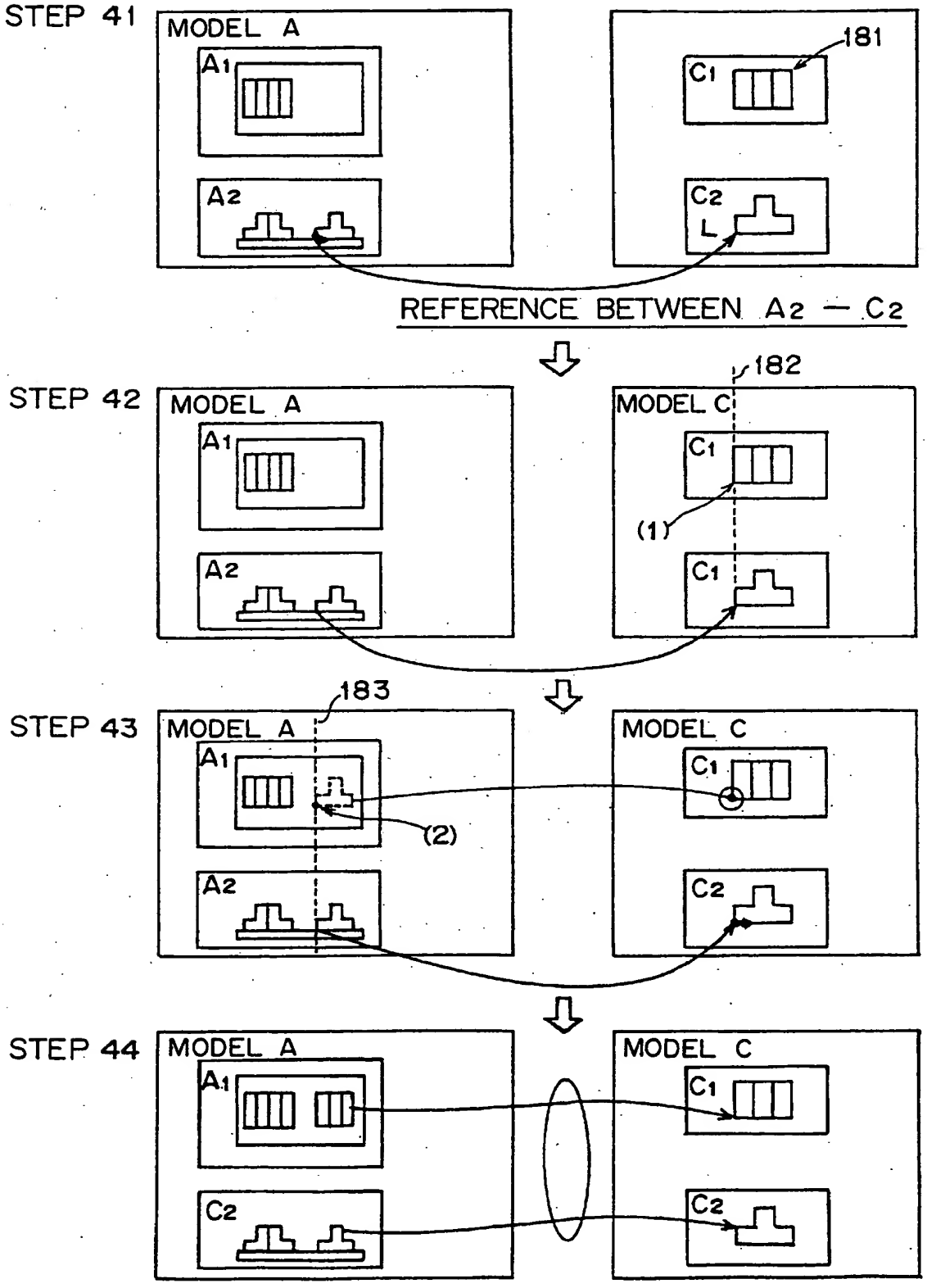

STEP 41
MODEL A
A1
A2
181
C1
C2
L
REFERENCE BETWEEN A2 — C2
STEP 42
MODEL A
A1
A2
182
MODEL C
C1
(1)
C1
STEP 43
183
MODEL A
A1
(2)
A2
MODEL C
C1
C2
STEP 44
MODEL A
A1
C2
MODEL C
C1
C2

FIG. 20

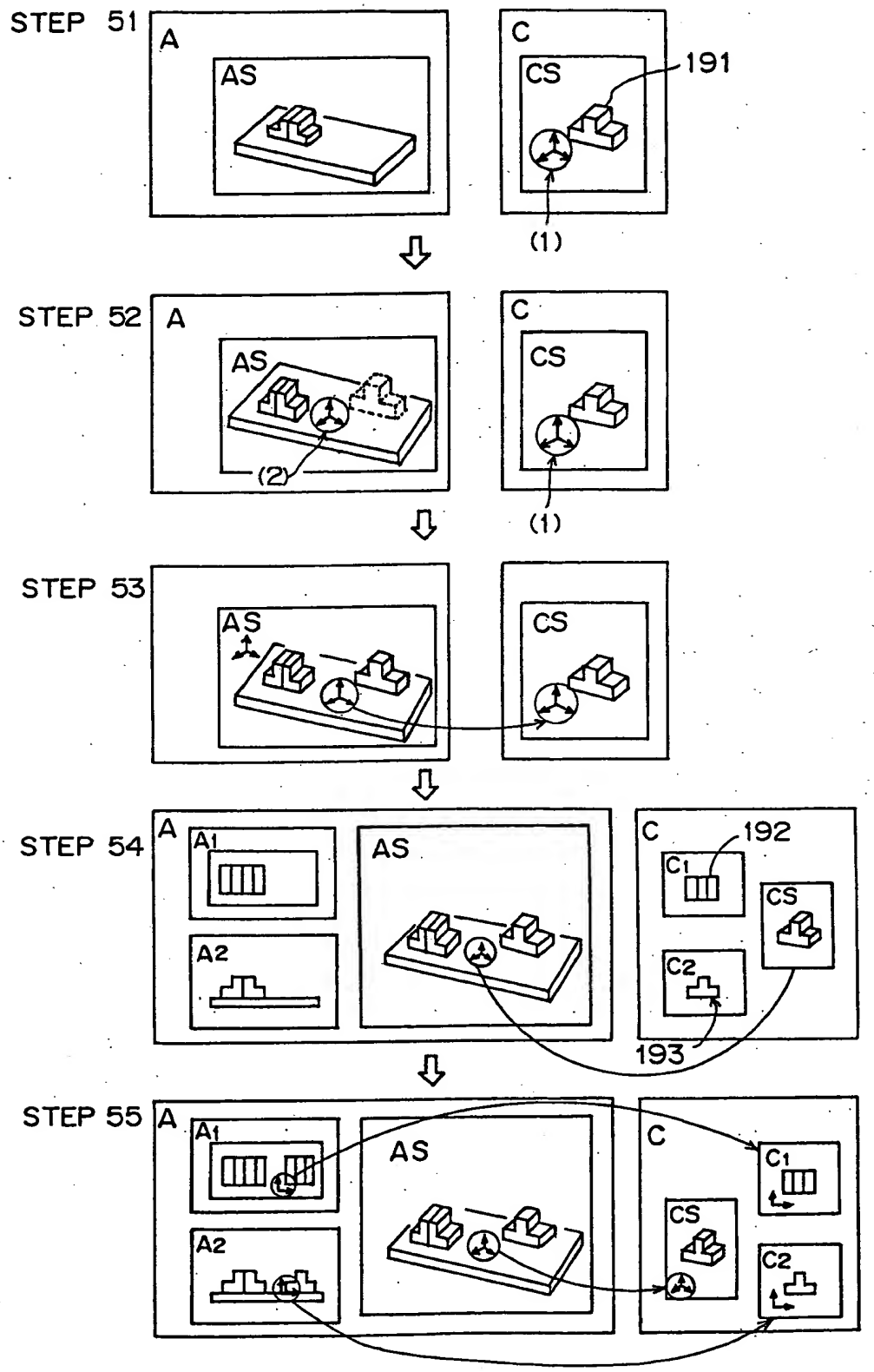

STEP 51
A
AS
C
CS
191
(1)
STEP 52
A
AS
(2)
C
CS
(1)
STEP 53
AS
CS
STEP 54
A
A1
A2
AS
C
192
C1
CS
C2
193
STEP 55
A
A1
A2
AS
C
C1
CS
C2

FIG. 21

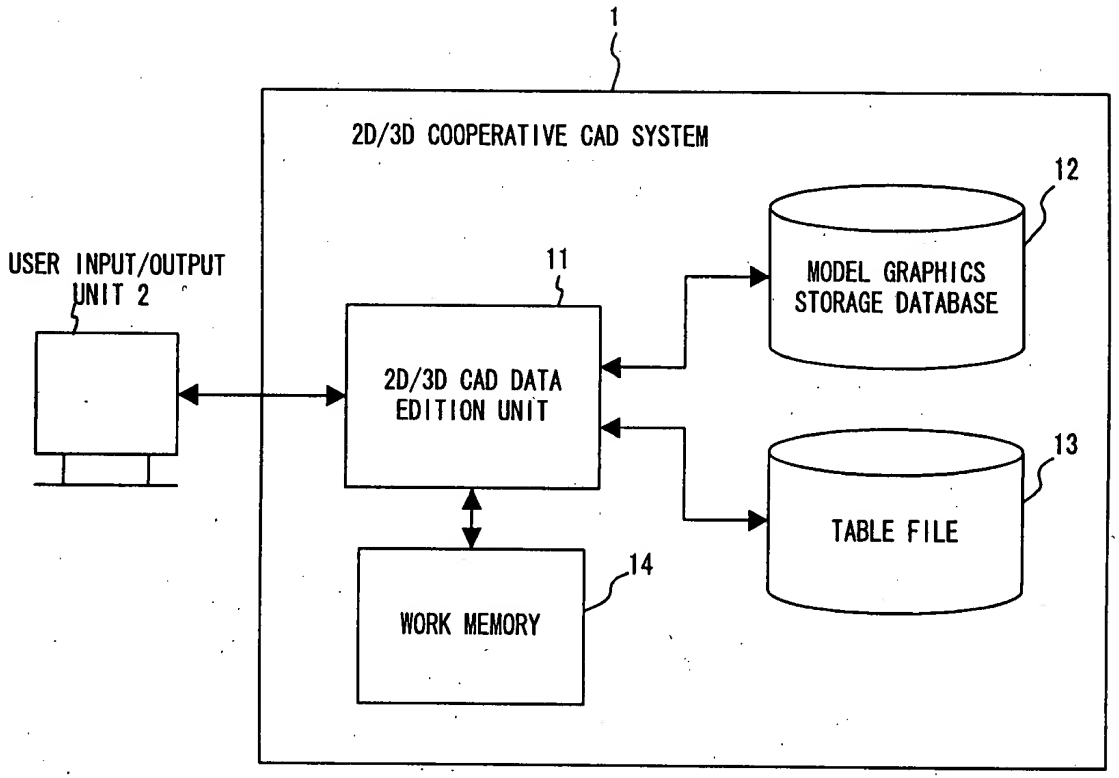

1
2D/3D COOPERATIVE CAD SYSTEM
12
MODEL GRAPHICS STORAGE DATABASE
USER INPUT/OUTPUT UNIT 2
11
2D/3D CAD DATA EDITION UNIT
13
TABLE FILE
14
WORK MEMORY

FIG. 22

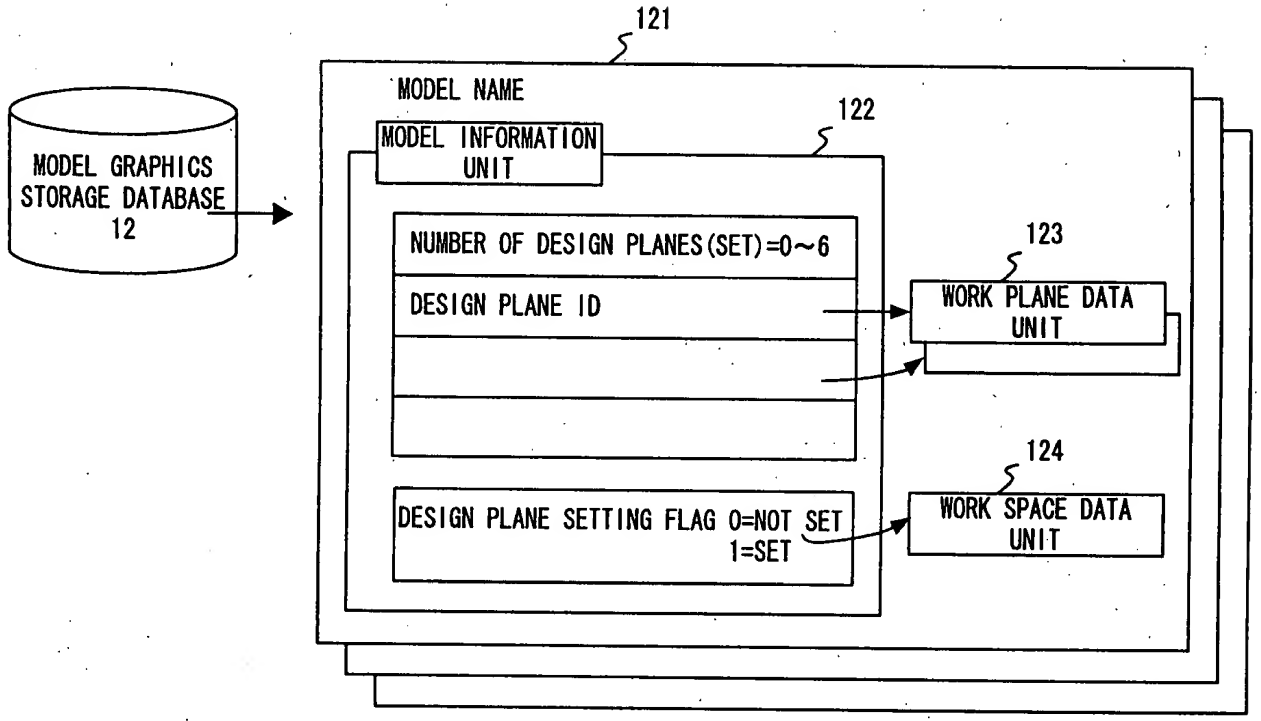

121
MODEL NAME
MODEL INFORMATION UNIT
122
MODEL GRAPHICS STORAGE DATABASE 12
NUMBER OF DESIGN PLANES(SET)=0~6
DESIGN PLANE ID
123
WORK PLANE DATA UNIT
124
DESIGN PLANE SETTING FLAG 0=NOT SET 1=SET
WORK SPACE DATA UNIT

FIG. 23

MODEL FILE NAME

WORK PLANE DATA UNIT(PLANE NAME=「XY」, ID=1)

GRAPHIC DATA UNIT

GRAPHIC ID	GRAPHIC INFORMATION
1	LINE:STARTING POINT, LENGTH, DIRECTION VECTOR
2	CIRCLE:CENTER, RADIUS
⋮	

SINGLE 2D PARTS STRUCTURE DATA UNIT

PART ID	2D REFERENCE INFORMATION						
	PLACEMENT POINT (X, Y)	PLACEMENT ANGLE	MIRROR FLAG 1=MIRROR EXISTING 0=MIRROR NOT EXISTING	MIRROR AXIS $\alpha:(\alpha,\beta)\rightarrow$ $\beta:(\alpha,\beta)\rightarrow$	MIRROR AXIS $(\alpha,-\beta)$ $(-\alpha,\beta)$	FILE NAME	PLANE DATA UNIT NAME
1	(20, 20)	0°	1/0	α/β		PART FIGURE 1	'XY'
2	(40, 100)	10°	1/0	α/β		PART FIGURE 2	'XZ'
⋮	⋮						

...

FIG. 24

MODEL FILE NAME

WORK PLANE DATA UNIT

GRAPHIC DATA UNIT

GRAPHIC ID	GRAPHIC INFORMATION
1	
2	
⋮	

SINGLE 3D PARTS DATA UNIT

PART ID	3D REFERENCE INFORMATION			
	PLACEMENT POINT (X, Y, Z)	FIRST AXIS	SECOND AXIS	FILE NAME
1	(0, 0, 0)	X AXIS (1, 0, 0)	Y AXIS (0, 1, 0)	PART FIGURE 10
2	(15, 10, 10)	-Y AXIS (0, -1, 0)	-Z AXIS (0, 0, -1)	PART FIGURE 2
⋮	⋮			

FIG. 25

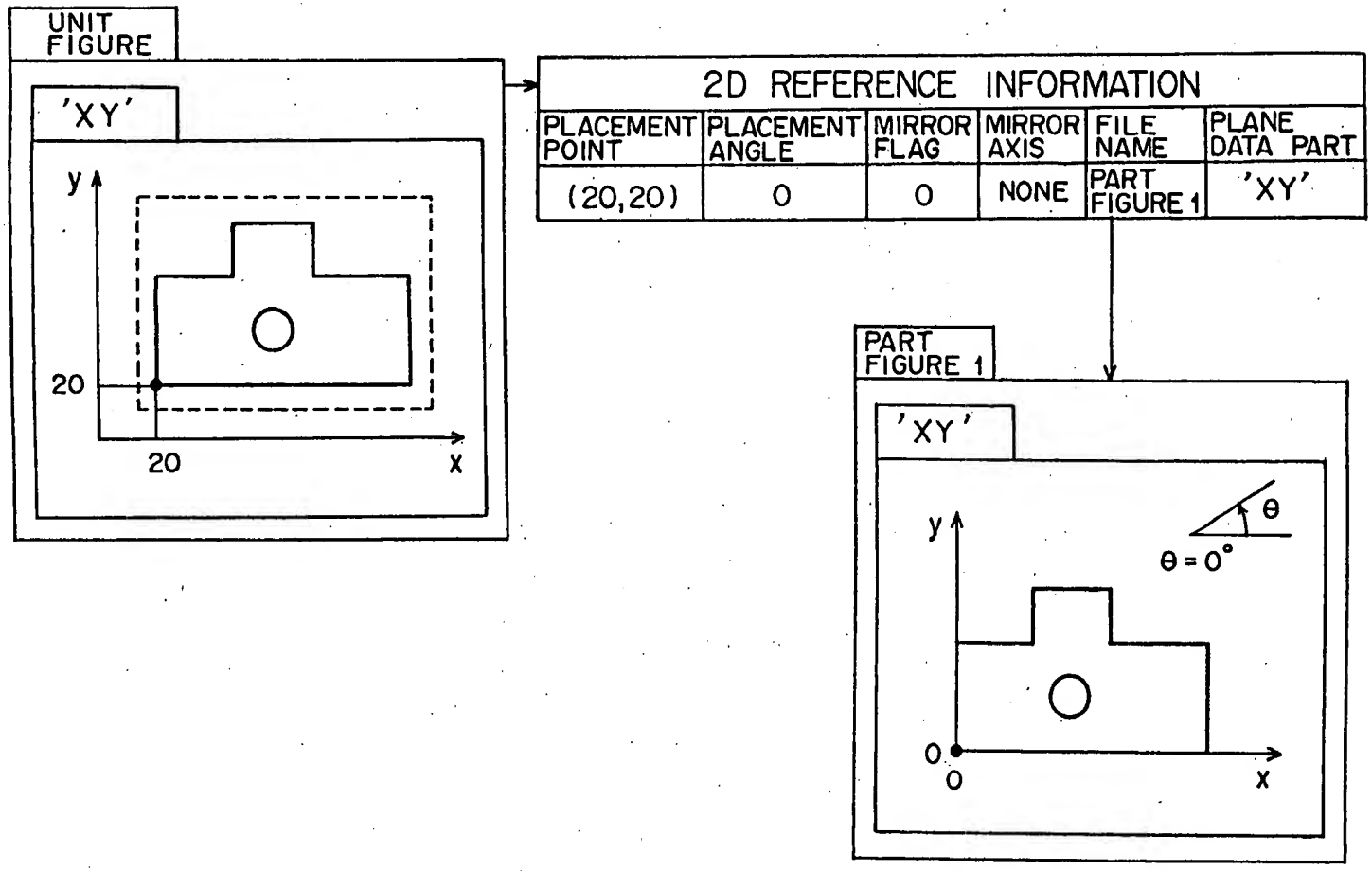

UNIT FIGURE
'XY'
y
20
20
x
2D REFERENCE INFORMATION
PLACEMENT POINT
PLACEMENT ANGLE
MIRROR FLAG
MIRROR AXIS
FILE NAME
PLANE DATA PART
(20,20)
0
0
NONE
PART FIGURE 1
'XY'
PART FIGURE 1
'XY'
y
θ
θ = 0°
0
0
x

FIG. 26

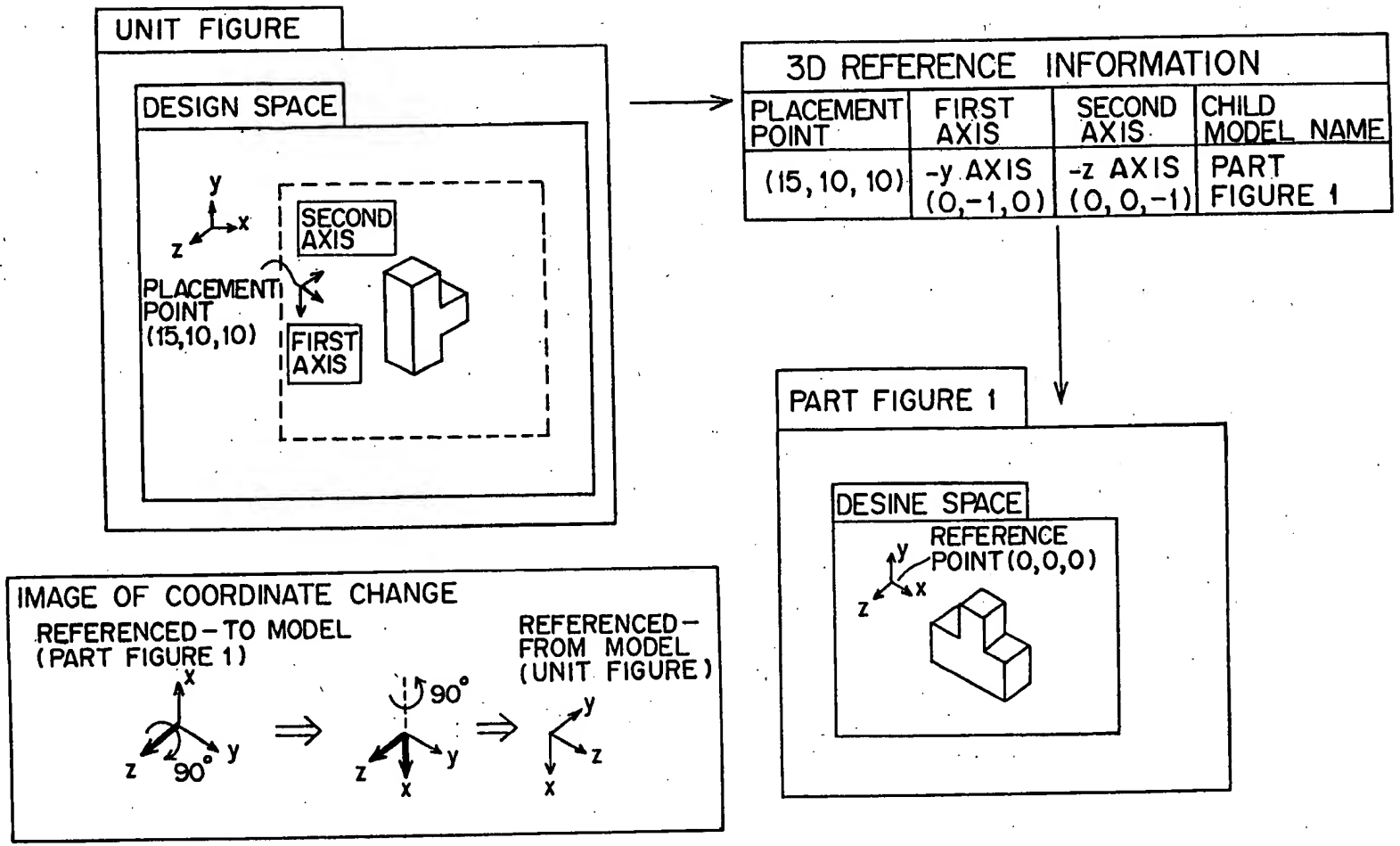
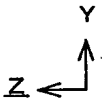
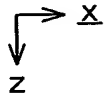
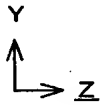
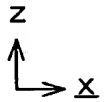
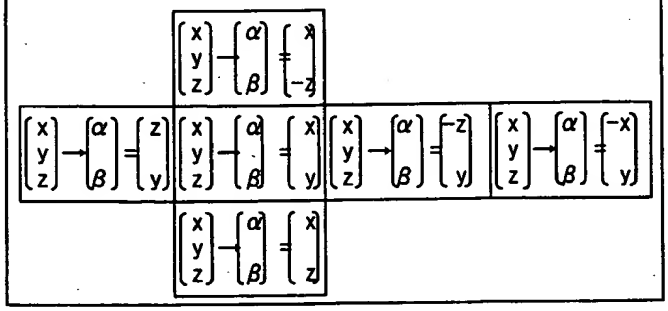

UNIT FIGURE
DESIGN SPACE
y
x
z
SECOND AXIS
PLACEMENT POINT (15,10,10)
FIRST AXIS
3D REFERENCE INFORMATION
PLACEMENT POINT
FIRST AXIS
SECOND AXIS
CHILD MODEL NAME
(15, 10, 10)
-y AXIS (0,-1,0)
-z AXIS (0, 0,-1)
PART FIGURE 1
PART FIGURE 1
DESINE SPACE
REFERENCE POINT (0,0,0)
IMAGE OF COORDINATE CHANGE
REFERENCED-TO MODEL (PART FIGURE 1)
REFERENCED-FROM MODEL (UNIT FIGURE)
90°
90°

FIG. 27

COORDINATE CORRESPONDENCE TABLE

PLANE ID	PLANE NAME	FIRST AXIS (α AXIS)	THREE-DIMENSIONAL COORDINATE AXIS VIEWED FROM EACH PLANE	CONVERSION EQUATION INTO 3D SPACE COORDINATE (CONVERSION MATRIX)
1	XY PLANE	X AXIS= (1, 0, 0)		$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \alpha \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} + \beta \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix}$ NORMAL VECTOR:Z AXIS =(0, 0, 1)
2	-ZY PLANE	-Z AXIS= (0, 0, -1)		$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \alpha \begin{pmatrix} 0 \\ 0 \\ -1 \end{pmatrix} + \beta \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix}$ NORMAL VECTOR:-X AXIS =(-1, 0, 0)
3	X-Z PLANE	X AXIS= (1, 0, 0)		$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \alpha \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} + \beta \begin{pmatrix} 0 \\ 0 \\ -1 \end{pmatrix}$ NORMAL VECTOR:-Y AXIS =(0, -1, 0)
4	ZY PLANE	Z AXIS= (0, 0, 1)		$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \alpha \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix} + \beta \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix}$ NORMAL VECTOR:X AXIS=(1, 0, 0)
5	XZ PLANE	X AXIS= (1, 0, 0)		$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \alpha \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix} + \beta \begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}$ NORMAL VECTOR:Y AXIS=(0, 1, 0)
6	-XY PLANE	-X AXIS= (-1, 0, 0)		$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \alpha \begin{pmatrix} -1 \\ 0 \\ 0 \end{pmatrix} + \beta \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix}$ NORMAL VECTOR:-Z AXIS =(0, 0, -1)

CONVERSION TABLE OF EACH PLANE
3D COORDINATE→2D COORDINATE
(x, y, z) (α, β)



CONVERSION TABLE OF EACH PLANE
2D COORDINATE→3D COORDINATE
(α, β) (x, y, z)

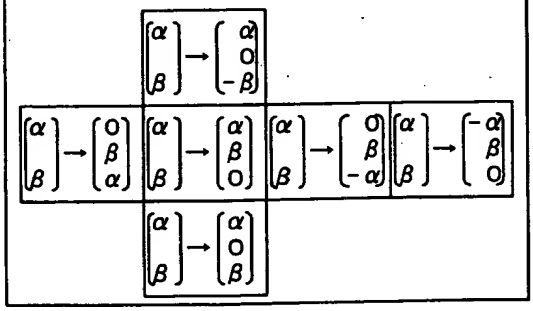


FIG. 28

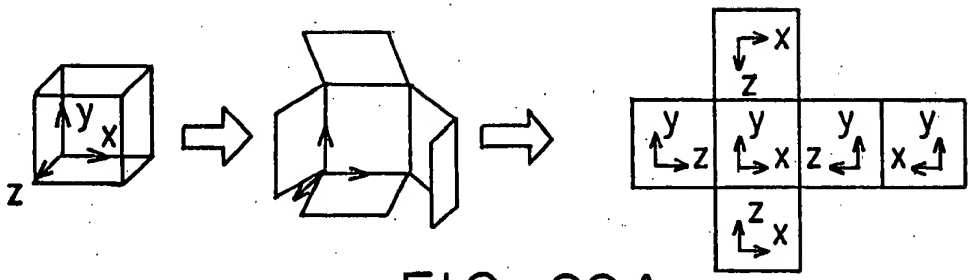


FIG. 29A

PLANE ID

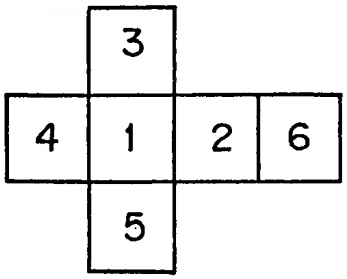


FIG. 29B

PLANE NAME

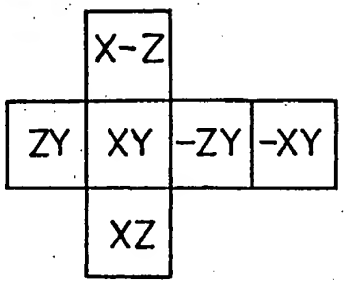


FIG. 29C

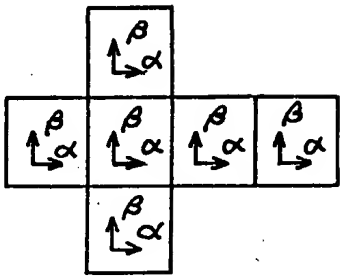


FIG. 29D

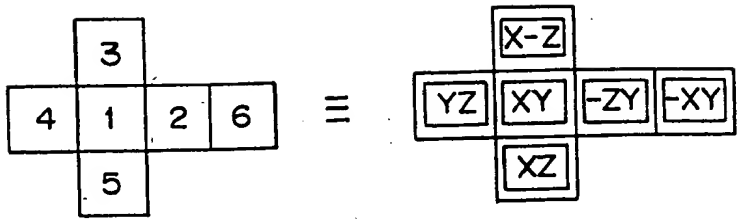


FIG. 30A

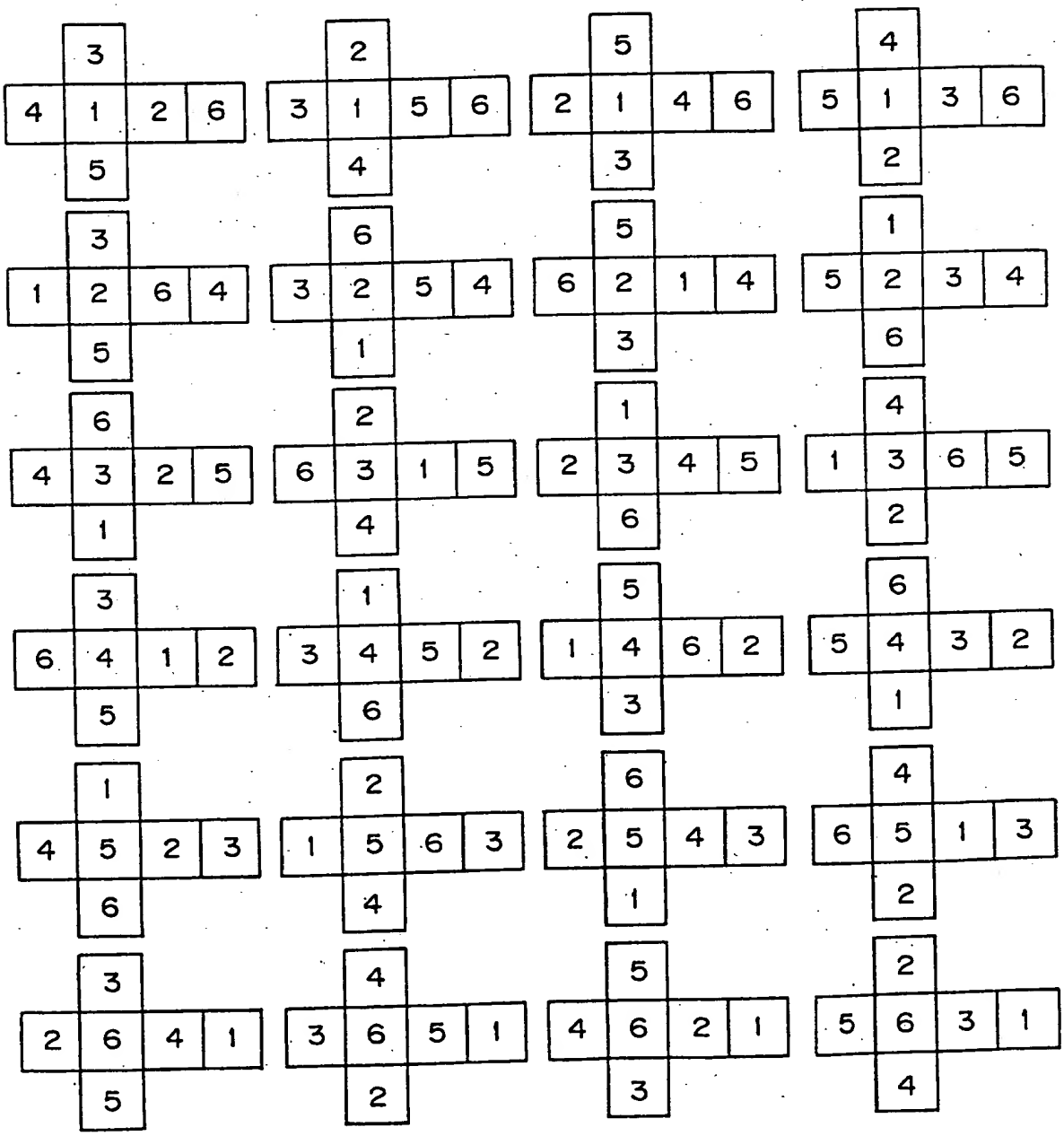
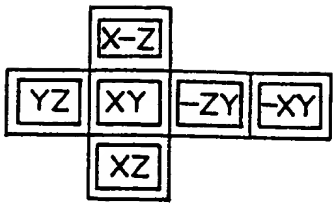
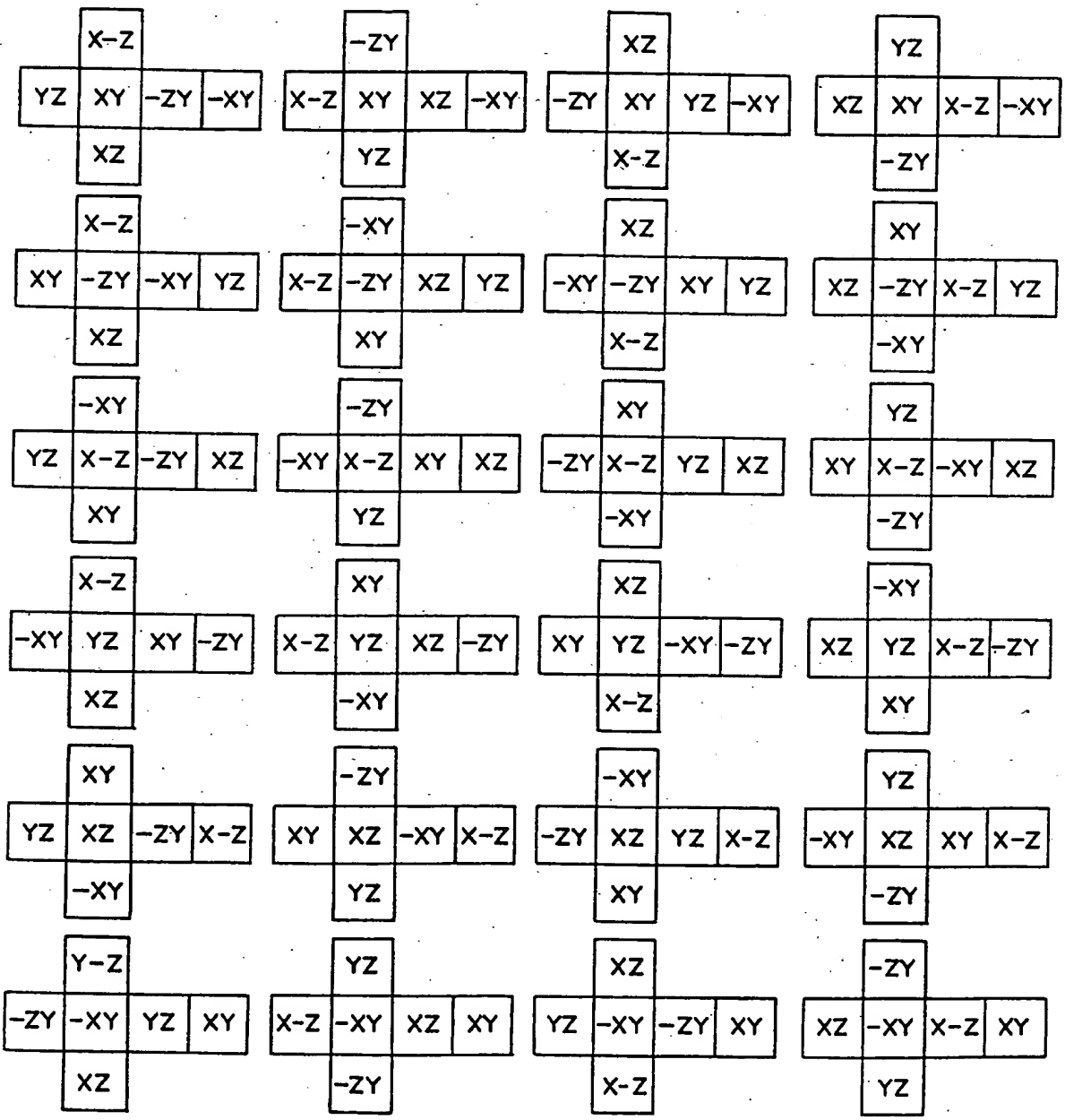


FIG. 30B





PARENT FIGURE
X-Z
YZ
XY
-ZY
-XY
XZ
CHILD FIGURE
X-Z
YZ
XY
-ZY
-XY
XZ
-ZY
X-Z
XY
XZ
-XY
YZ
XZ
-ZY
XY
YZ
-XY
X-Z
YZ
XZ
XY
X-Z
-XY
-ZY
X-Z
XY
-ZY
-XY
YZ
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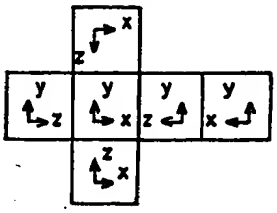
YZ
X-Z
-XY
XZ
XY
-ZY
XZ
YZ
-XY
-ZY
XY
X-Z
-ZY
XZ
-XY
X-Z
XY
YZ

FIG. 31

PARENT FIGURE



CHILD FIGURE

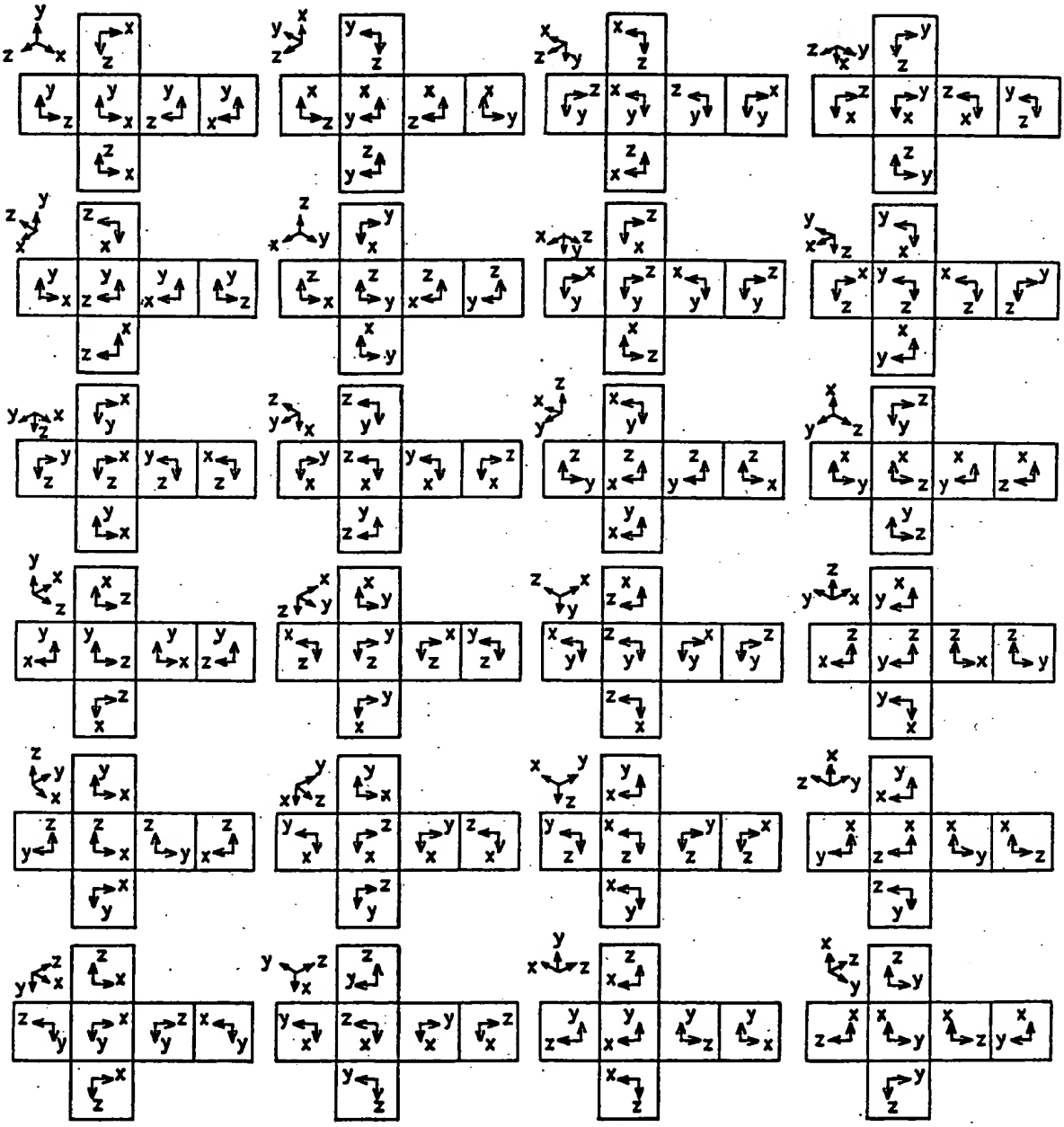
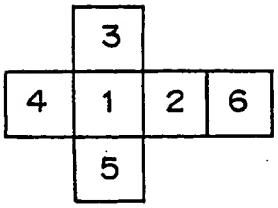
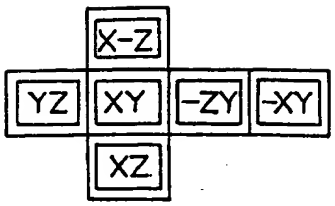


FIG. 32





0°, ±90°, 180°, 270° :
COUNTERCLOCKWISE
REVOLUTION

α (α MIRROR) :

β (β MIRROR) :

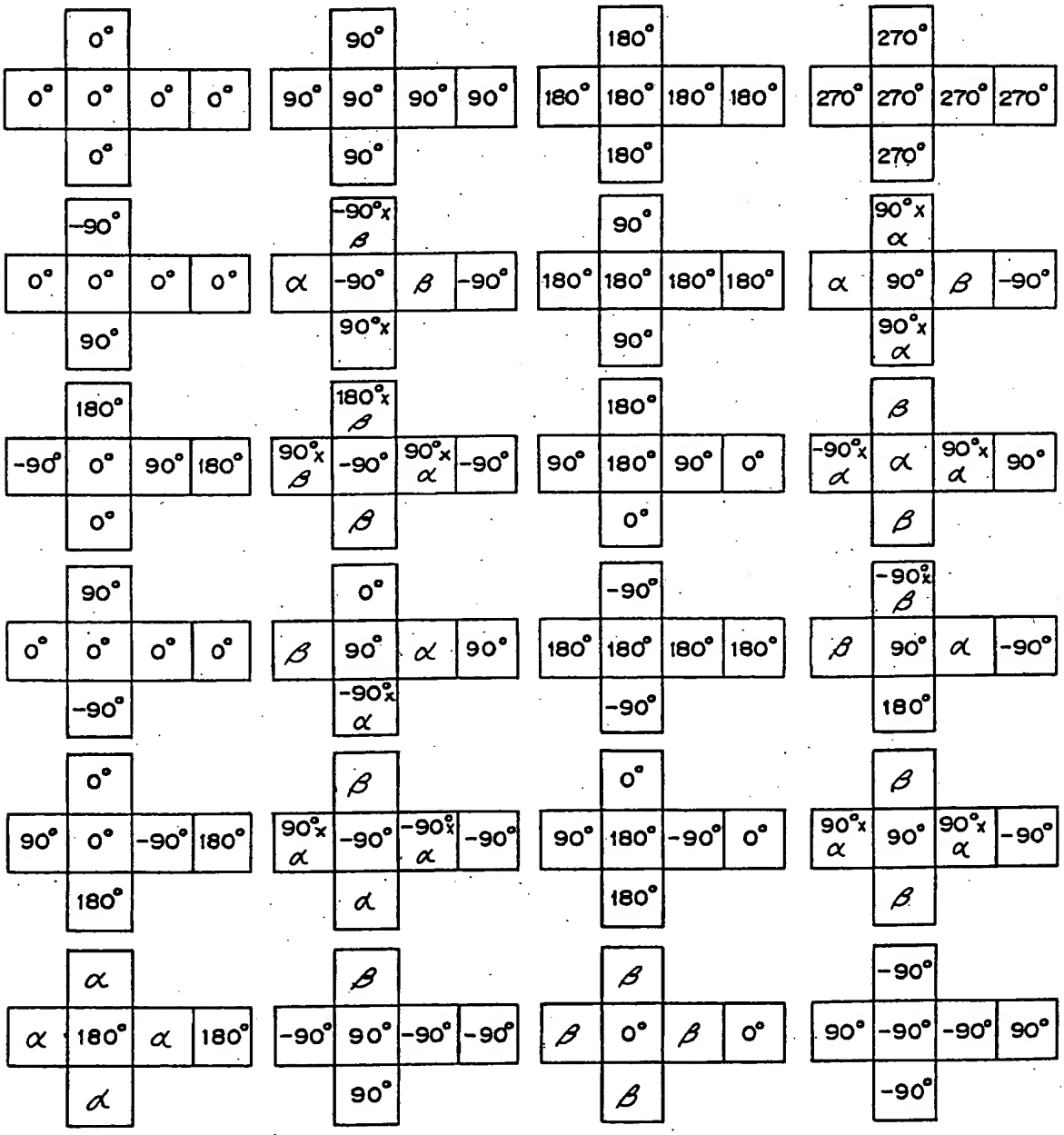


FIG. 33

$\begin{pmatrix} x \\ y \\ z \end{pmatrix} \rightarrow \begin{pmatrix} x \\ y \\ z \end{pmatrix}$ $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$	$\begin{pmatrix} x \\ y \\ z \end{pmatrix} \rightarrow \begin{pmatrix} -y \\ x \\ z \end{pmatrix}$ $\begin{bmatrix} 0 & -1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$	$\begin{pmatrix} x \\ y \\ z \end{pmatrix} \rightarrow \begin{pmatrix} -x \\ -y \\ z \end{pmatrix}$ $\begin{bmatrix} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$	$\begin{pmatrix} x \\ y \\ z \end{pmatrix} \rightarrow \begin{pmatrix} y \\ -x \\ z \end{pmatrix}$ $\begin{bmatrix} 0 & 1 & 0 \\ -1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$
$\begin{pmatrix} x \\ y \\ z \end{pmatrix} \rightarrow \begin{pmatrix} -z \\ y \\ x \end{pmatrix}$ $\begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$	$\begin{pmatrix} x \\ y \\ z \end{pmatrix} \rightarrow \begin{pmatrix} y \\ z \\ x \end{pmatrix}$ $\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{bmatrix}$	$\begin{pmatrix} x \\ y \\ z \end{pmatrix} \rightarrow \begin{pmatrix} z \\ -y \\ x \end{pmatrix}$ $\begin{bmatrix} 0 & 0 & 1 \\ 0 & -1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$	$\begin{pmatrix} x \\ y \\ z \end{pmatrix} \rightarrow \begin{pmatrix} -y \\ -z \\ x \end{pmatrix}$ $\begin{bmatrix} 0 & -1 & 0 \\ 0 & 0 & -1 \\ 1 & 0 & 0 \end{bmatrix}$
$\begin{pmatrix} x \\ y \\ z \end{pmatrix} \rightarrow \begin{pmatrix} x \\ -z \\ y \end{pmatrix}$ $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & -1 \\ 0 & 1 & 0 \end{bmatrix}$	$\begin{pmatrix} x \\ y \\ z \end{pmatrix} \rightarrow \begin{pmatrix} -z \\ -x \\ y \end{pmatrix}$ $\begin{bmatrix} 0 & 0 & -1 \\ -1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$	$\begin{pmatrix} x \\ y \\ z \end{pmatrix} \rightarrow \begin{pmatrix} -x \\ z \\ y \end{pmatrix}$ $\begin{bmatrix} -1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$	$\begin{pmatrix} x \\ y \\ z \end{pmatrix} \rightarrow \begin{pmatrix} z \\ x \\ y \end{pmatrix}$ $\begin{bmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$
$\begin{pmatrix} x \\ y \\ z \end{pmatrix} \rightarrow \begin{pmatrix} z \\ y \\ -x \end{pmatrix}$ $\begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ -1 & 0 & 0 \end{bmatrix}$	$\begin{pmatrix} x \\ y \\ z \end{pmatrix} \rightarrow \begin{pmatrix} y \\ -z \\ -x \end{pmatrix}$ $\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & -1 \\ -1 & 0 & 0 \end{bmatrix}$	$\begin{pmatrix} x \\ y \\ z \end{pmatrix} \rightarrow \begin{pmatrix} -z \\ -y \\ -x \end{pmatrix}$ $\begin{bmatrix} 0 & 0 & -1 \\ 0 & -1 & 0 \\ -1 & 0 & 0 \end{bmatrix}$	$\begin{pmatrix} x \\ y \\ z \end{pmatrix} \rightarrow \begin{pmatrix} -y \\ z \\ -x \end{pmatrix}$ $\begin{bmatrix} 0 & -1 & 0 \\ 0 & 0 & 1 \\ -1 & 0 & 0 \end{bmatrix}$
$\begin{pmatrix} x \\ y \\ z \end{pmatrix} \rightarrow \begin{pmatrix} x \\ z \\ -y \end{pmatrix}$ $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & -1 & 0 \end{bmatrix}$	$\begin{pmatrix} x \\ y \\ z \end{pmatrix} \rightarrow \begin{pmatrix} z \\ -x \\ -y \end{pmatrix}$ $\begin{bmatrix} 0 & 0 & 1 \\ -1 & 0 & 0 \\ 0 & -1 & 0 \end{bmatrix}$	$\begin{pmatrix} x \\ y \\ z \end{pmatrix} \rightarrow \begin{pmatrix} -x \\ -z \\ -y \end{pmatrix}$ $\begin{bmatrix} -1 & 0 & 0 \\ 0 & 0 & -1 \\ 0 & -1 & 0 \end{bmatrix}$	$\begin{pmatrix} x \\ y \\ z \end{pmatrix} \rightarrow \begin{pmatrix} -z \\ x \\ -y \end{pmatrix}$ $\begin{bmatrix} 0 & 0 & -1 \\ 1 & 0 & 0 \\ 0 & -1 & 0 \end{bmatrix}$
$\begin{pmatrix} x \\ y \\ z \end{pmatrix} \rightarrow \begin{pmatrix} x \\ -y \\ -z \end{pmatrix}$ $\begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & -1 \end{bmatrix}$	$\begin{pmatrix} x \\ y \\ z \end{pmatrix} \rightarrow \begin{pmatrix} -y \\ -x \\ -z \end{pmatrix}$ $\begin{bmatrix} 0 & -1 & 0 \\ -1 & 0 & 0 \\ 0 & 0 & -1 \end{bmatrix}$	$\begin{pmatrix} x \\ y \\ z \end{pmatrix} \rightarrow \begin{pmatrix} -x \\ y \\ -z \end{pmatrix}$ $\begin{bmatrix} -1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & -1 \end{bmatrix}$	$\begin{pmatrix} x \\ y \\ z \end{pmatrix} \rightarrow \begin{pmatrix} y \\ x \\ -z \end{pmatrix}$ $\begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & -1 \end{bmatrix}$

FIG. 34

ASSEMBLY MANAGEMENT TABLE

NUMBER OF MODELS=N	
MODEL ID	MODEL NAME
1	TOTAL NUMBER OF FIGURE SETS
2	UNIT FIGURE 1
⋮	⋮
N	PART FIGURE 10

FIG. 35

ORDER ID	PARENT MODEL ID	PLACED CHILD MODEL ID	NUMBER OF PLACED MODELS	TERMINAL PROCESS FLAG
A	1	2, 3, 4,	3	0
B	2	5, 6	2	0
C	3	7, 8	2	1
D	4	9, 10	2	0
E	5	11, 12	2	1
F	6	13	1	1
G	9	14	1	1
H	10	15, 16	2	0
I	15	17	1	1

FIG. 36

TERMINAL MODEL TABLE

NUMBER OF TERMINAL MODELS = N

NUMBER	1	2	3	4	5	6	7	8
MODEL ID	7	8	11	12	13	14	16	17

FIG. 37

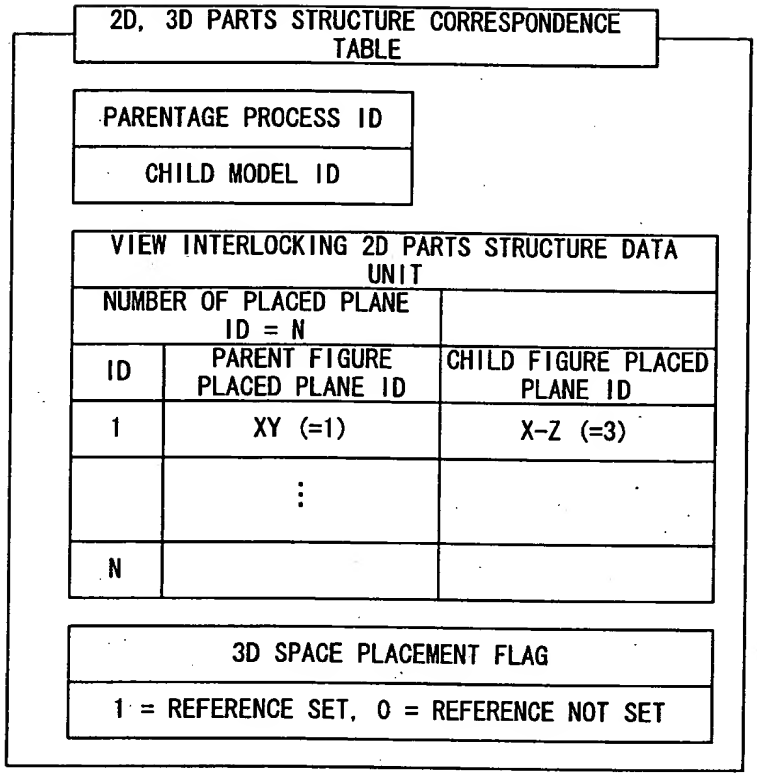

2D, 3D PARTS STRUCTURE CORRESPONDENCE TABLE
PARENTAGE PROCESS ID
CHILD MODEL ID
VIEW INTERLOCKING 2D PARTS STRUCTURE DATA UNIT
NUMBER OF PLACED PLANE ID = N
ID
PARENT FIGURE PLACED PLANE ID
CHILD FIGURE PLACED PLANE ID
1
XY (=1)
X-Z (=3)
N
3D SPACE PLACEMENT FLAG
1 = REFERENCE SET, 0 = REFERENCE NOT SET

FIG. 38

PRIOR PARENT HOLDING TABLE

PARENTAGE PROCESS ID		
NUMBER OF CHILD MODELS		
ID	CHILD MODEL ID	CHECK FLAG
1	5	1
2	6	0

FIG. 39

SPATIAL PLACEMENT INFORMATION TEMP DATA

3D PLACEMENT POSITION	(x, y, z)
FIRST AXIS	(1, 0, 0)
SECOND AXIS	(0, 1, 0)

FIG. 40

PARALLEL PLANE MANAGEMENT TABLE

COMBINATION ID	PLANE 1	PLANE 2
1	1	6
2	2	4
3	3	5

FIG. 41

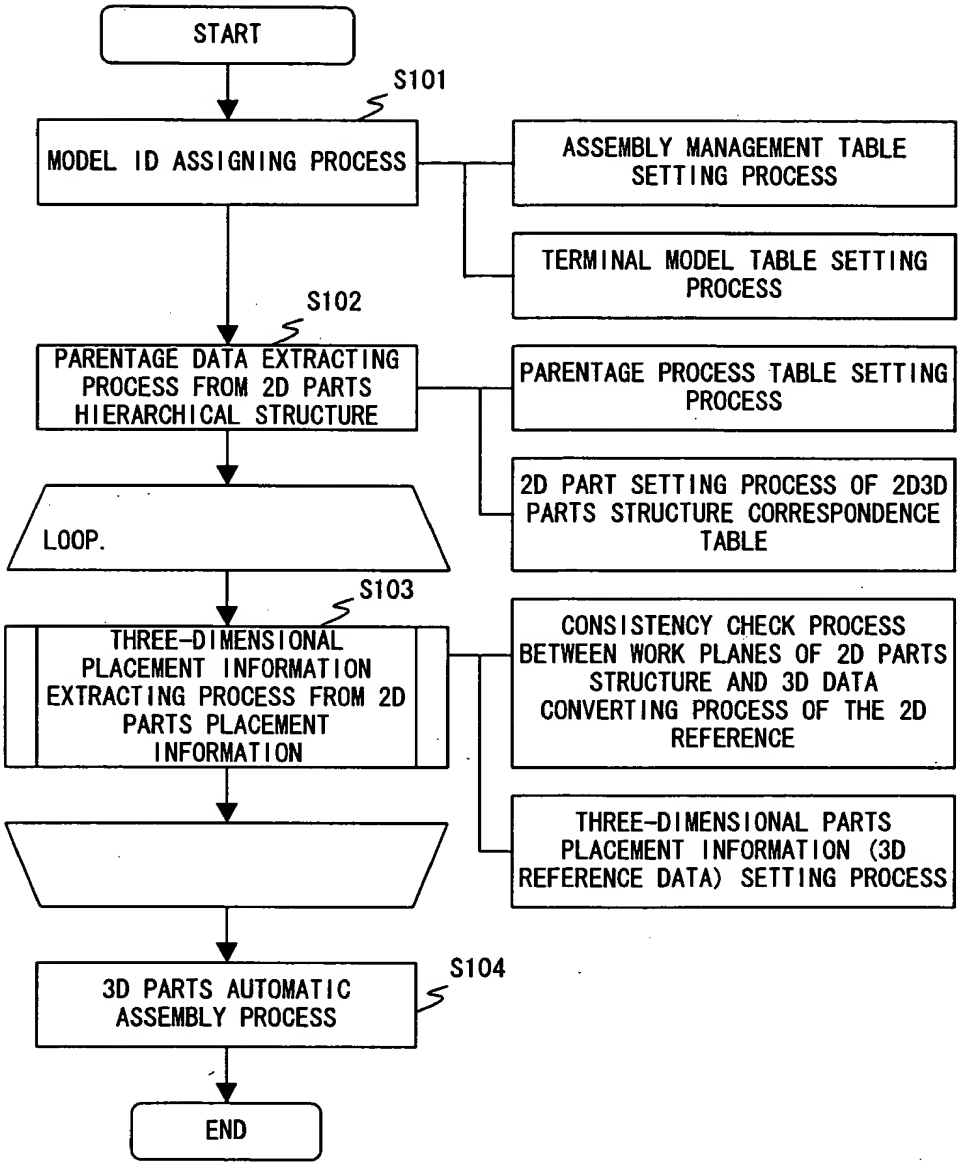

START
S101
MODEL ID ASSIGNING PROCESS
ASSEMBLY MANAGEMENT TABLE SETTING PROCESS
TERMINAL MODEL TABLE SETTING PROCESS
S102
PARENTAGE DATA EXTRACTING PROCESS FROM 2D PARTS HIERARCHICAL STRUCTURE
PARENTAGE PROCESS TABLE SETTING PROCESS
2D PART SETTING PROCESS OF 2D3D PARTS STRUCTURE CORRESPONDENCE TABLE
LOOP.
S103
THREE-DIMENSIONAL PLACEMENT INFORMATION EXTRACTING PROCESS FROM 2D PARTS PLACEMENT INFORMATION
CONSISTENCY CHECK PROCESS BETWEEN WORK PLANES OF 2D PARTS STRUCTURE AND 3D DATA CONVERTING PROCESS OF THE 2D REFERENCE
THREE-DIMENSIONAL PARTS PLACEMENT INFORMATION (3D REFERENCE DATA) SETTING PROCESS
S104
3D PARTS AUTOMATIC ASSEMBLY PROCESS
END

FIG. 42

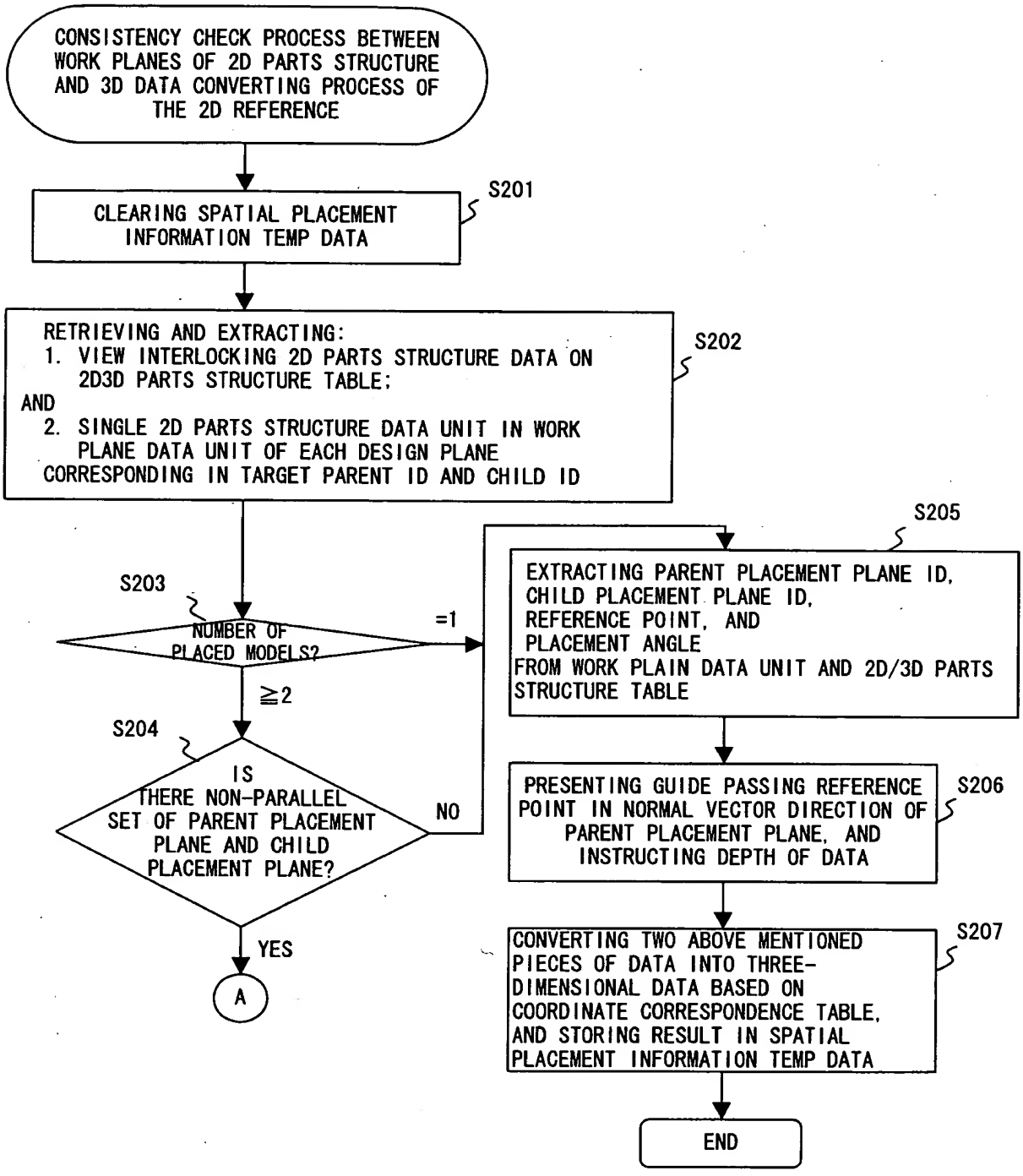

CONSISTENCY CHECK PROCESS BETWEEN WORK PLANES OF 2D PARTS STRUCTURE AND 3D DATA CONVERTING PROCESS OF THE 2D REFERENCE
CLEARING SPATIAL PLACEMENT INFORMATION TEMP DATA
S201
RETRIEVING AND EXTRACTING:
1. VIEW INTERLOCKING 2D PARTS STRUCTURE DATA ON 2D3D PARTS STRUCTURE TABLE;
AND
2. SINGLE 2D PARTS STRUCTURE DATA UNIT IN WORK PLANE DATA UNIT OF EACH DESIGN PLANE CORRESPONDING IN TARGET PARENT ID AND CHILD ID
S202
S203
NUMBER OF PLACED MODELS?
=1
≧2
S204
IS THERE NON-PARALLEL SET OF PARENT PLACEMENT PLANE AND CHILD PLACEMENT PLANE?
NO
YES
A
S205
EXTRACTING PARENT PLACEMENT PLANE ID, CHILD PLACEMENT PLANE ID, REFERENCE POINT, AND PLACEMENT ANGLE FROM WORK PLAIN DATA UNIT AND 2D/3D PARTS STRUCTURE TABLE
PRESENTING GUIDE PASSING REFERENCE POINT IN NORMAL VECTOR DIRECTION OF PARENT PLACEMENT PLANE, AND INSTRUCTING DEPTH OF DATA
S206
CONVERTING TWO ABOVE MENTIONED PIECES OF DATA INTO THREE-DIMENSIONAL DATA BASED ON COORDINATE CORRESPONDENCE TABLE, AND STORING RESULT IN SPATIAL PLACEMENT INFORMATION TEMP DATA
S207
END

FIG. 43

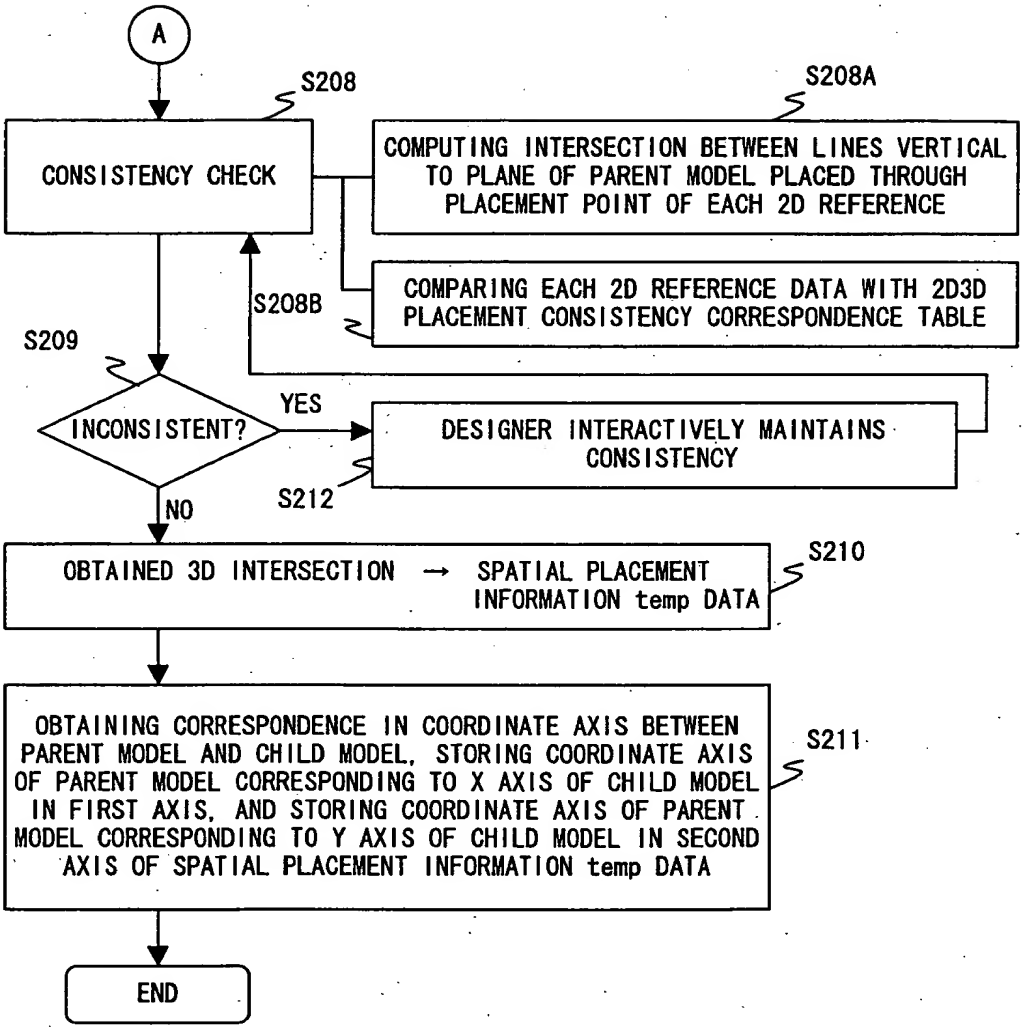

A
S208
CONSISTENCY CHECK
S208A
COMPUTING INTERSECTION BETWEEN LINES VERTICAL TO PLANE OF PARENT MODEL PLACED THROUGH PLACEMENT POINT OF EACH 2D REFERENCE
S208B
COMPARING EACH 2D REFERENCE DATA WITH 2D3D PLACEMENT CONSISTENCY CORRESPONDENCE TABLE
S209
INCONSISTENT?
YES
DESIGNER INTERACTIVELY MAINTAINS CONSISTENCY
S212
NO
OBTAINED 3D INTERSECTION → SPATIAL PLACEMENT INFORMATION temp DATA
S210
OBTAINING CORRESPONDENCE IN COORDINATE AXIS BETWEEN PARENT MODEL AND CHILD MODEL, STORING COORDINATE AXIS OF PARENT MODEL CORRESPONDING TO X AXIS OF CHILD MODEL IN FIRST AXIS, AND STORING COORDINATE AXIS OF PARENT MODEL CORRESPONDING TO Y AXIS OF CHILD MODEL IN SECOND AXIS OF SPATIAL PLACEMENT INFORMATION temp DATA
S211
END

FIG. 44

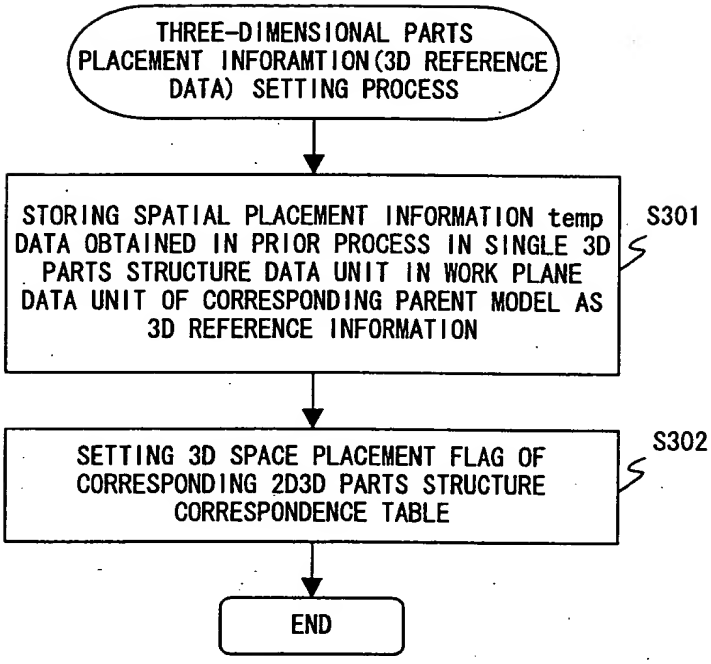

THREE-DIMENSIONAL PARTS PLACEMENT INFORAMTION(3D REFERENCE DATA) SETTING PROCESS
STORING SPATIAL PLACEMENT INFORMATION temp DATA OBTAINED IN PRIOR PROCESS IN SINGLE 3D PARTS STRUCTURE DATA UNIT IN WORK PLANE DATA UNIT OF CORRESPONDING PARENT MODEL AS 3D REFERENCE INFORMATION
S301
SETTING 3D SPACE PLACEMENT FLAG OF CORRESPONDING 2D3D PARTS STRUCTURE CORRESPONDENCE TABLE
S302
END

FIG. 45

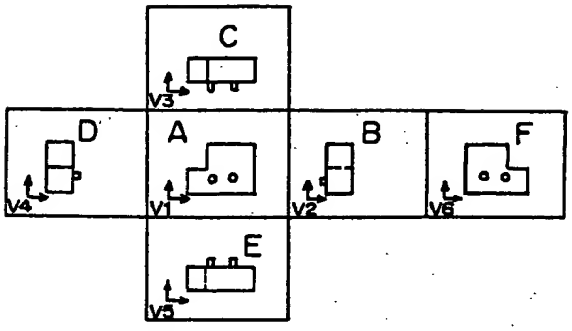


FIG. 46A

		V1	V2	V3	V4	V5	V6
A							
B							
C							
D							
E							
F							

FIG. 46B

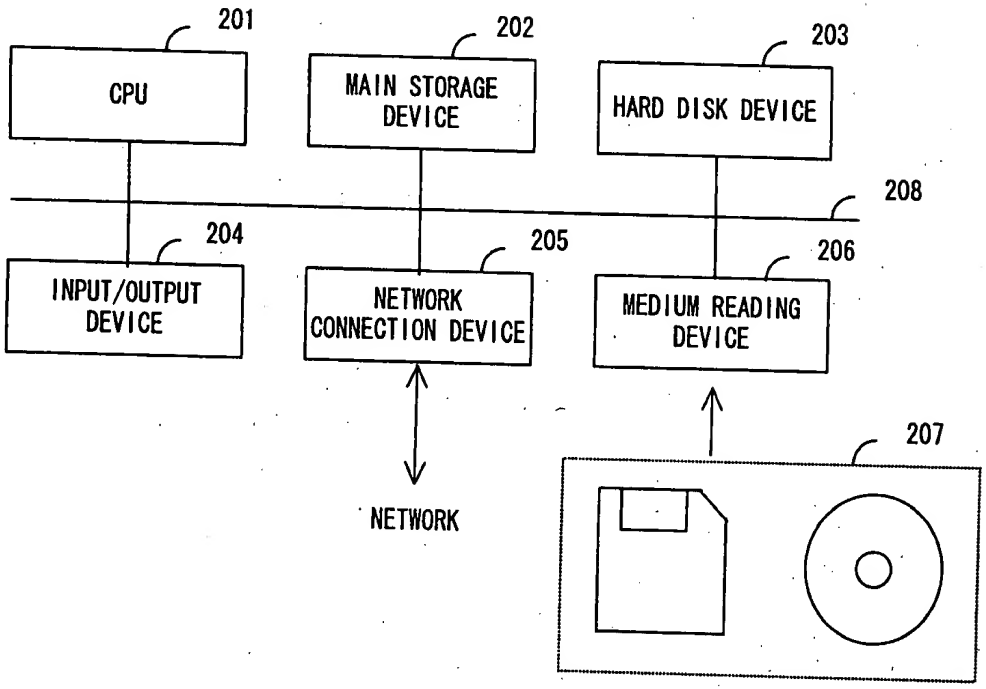

201
CPU
202
MAIN STORAGE DEVICE
203
HARD DISK DEVICE
208
204
INPUT/OUTPUT DEVICE
205
NETWORK CONNECTION DEVICE
206
MEDIUM READING DEVICE
NETWORK
207

FIG. 47

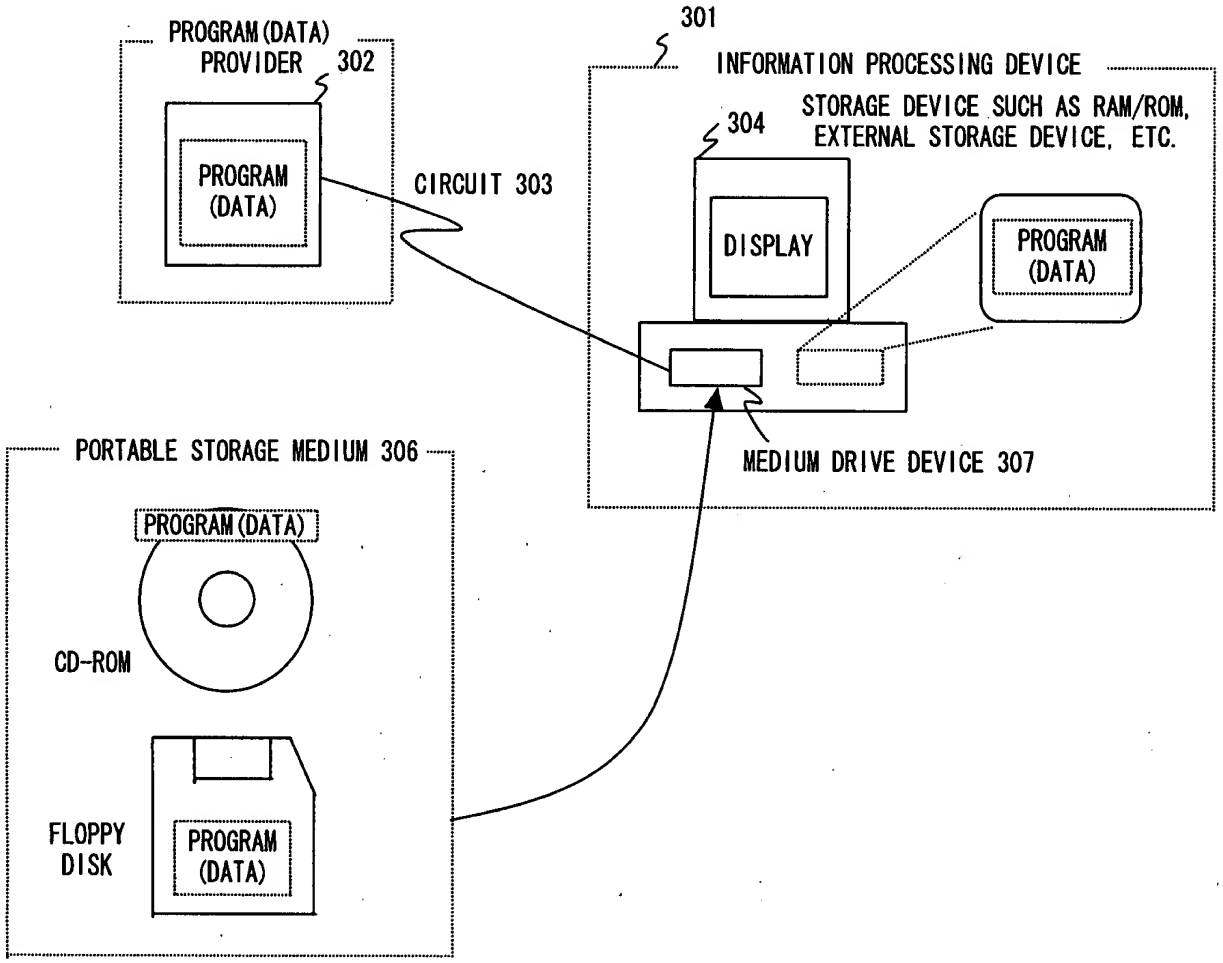

PROGRAM (DATA) PROVIDER
302
PROGRAM (DATA)
CIRCUIT 303
301
INFORMATION PROCESSING DEVICE
304
STORAGE DEVICE SUCH AS RAM/ROM, EXTERNAL STORAGE DEVICE, ETC.
DISPLAY
PROGRAM (DATA)
MEDIUM DRIVE DEVICE 307
PORTABLE STORAGE MEDIUM 306
PROGRAM (DATA)
CD-ROM
FLOPPY DISK
PROGRAM (DATA)

FIG. 48